Quality Report

on Waste Statistics 2018
generation of waste and recovery and disposal of waste
according to EU Regulation on Waste Statistics

Sweden

Content

1. Contact

1.1 Contact organisation

Swedish Environmental Protection Agency.

1.2 Contact organisation unit

Name: Agnes Willén
Telephone: +46 10-698 12 59
E-mail: Agnes.willen@naturvardsverket.se

Organisation: Swedish Environmental Protection Agency,
SE-106 48 Stockholm, Sweden

1.5 Contact mail address

SE-106 48 Stockholm, Sweden.

2. Introduction

The Swedish Environmental Protection Agency (Swedish EPA) is responsible for reporting to the Commission according to the Waste Statistic Regulation and other waste related regulations. The Swedish EPA is also responsible for producing and publishing the official national statistics on waste according to the Swedish Ordinance on Official Statistics. The Swedish EPA has a framework agreement with the SMED consortium (Swedish Environmental Emission Data) for the provision of services regarding data collection, statistics production and the development of methodology for waste statistics production. The waste statistics with accompanying documentation have been produced by SMED. A large number of other organisations and government agencies that have provided data to the production of the statistics.

3. Quality management – assessment

Relevance and accuracy

For most economic activities (NACE), relevance and accuracy are good. However, for a few activities data is more uncertain, which is indicated with the "E" flag in GENER.

Timeliness

The timetable was set up in order to deliver data to Eurostat and Swedish EPA in time. The deadlines have been met.

Accessibility

The statistics is published in Statistics Sweden's Statistical database[1], which is open to all. The quality report and the report "Waste in Sweden 2018" will be published by Swedish EPA in June 2020. Extracts from the statistics will also be published on the Swedish EPA's website. Information leaflets regarding waste statistics for certain NACEs have been available on the Swedish EPAs website since March 31st 2020.

Comparability

The regulatory framework and guidelines from Eurostat have been followed as far as possible. This should guarantee that the statistics are comparable with corresponding statistics from other member states. The current survey WStatR2020 is essentially comparable to the prior surveys WStatR2018, WStatR2016, WStat2014 and WStatR2012.

Coherence

The Swedish official statistics on generated and treated waste are based on the same general statistical information, same general methods, scopes and limitations as other statistics that are reported to Eurostat.

[1] http://www.scb.se/en_/Finding-statistics/Statistics-by-subject-area/Environment/Waste/Waste-generated-and-treated/

4. Relevance

4.1. Relevance - User Needs

There are many different users of waste statistics - citizens, politicians, municipal, regional and national authorities, central government offices, industry, researchers, press reporters, the public, etc. The needs differ depending on type of user. Some users are interested in the total numbers from the statistics, whereas others are interested in certain NACE or sub-categories of NACE, or certain waste types.

4.2. Relevance - User Satisfaction

Apart from the reporting obligations to the EU in accordance with the waste statistics regulation, statistics on waste generation and recovery and disposal of waste are needed in Sweden for the follow-up and development of environmental policies, the 16 national environmental objectives, the national waste management plan, and other action plans. The existing waste statistics are considered to be useful for both the follow-up and the development of action plans in this field, even if follow-up indicators and other uses based on the statistics need to be further developed.

4.3. Completeness

Table 1. Description of missing data in data set one on waste generation.

Description of missing data (waste category, economic activity, ..)	Explanation	How to overcome the deficit

No missing data in dataset 1.

Table 2. Description of missing data in data set two and three on treated waste quantities and capacities.

Description of missing data (waste category, treatment category, region, ...)	Explanation	How to overcome the deficit

No missing data in dataset 2 and 3.

4.3.1. Data completeness – rate

The data on waste generation is considered to be complete across waste types and economic activities, i.e. the rate is 100%. In the cells where the reported values are zero, there are strong indications that the combinations

of waste type and economic activities are not occurring. For example, the waste type may not reported by any of the several hundred enterprises included in the survey, or that the combinations of activity and waste type is extremely unlikely.

The data on waste treatment is also considered to be complete for all facilities with permission to treat waste. The data covers all incineration, with and without energy recovery, all landfilling, all other disposal, and most of the recovery. Backfilling and recovery of inert wastes (mineral waste and soils) in smaller facilities is not covered, but the overall rate is considered to be very close to 100%. In the cells where the reported values are zero, the combinations of waste type and treatment method are not occurring.

5. Accuracy and reliability

5.1. Accuracy – overall

The overall accuracy varies between industries and types of waste. Typically, the accuracy is good for waste treatment and for generated waste from waste treatment facilities, households, and in industrial branches with large amounts of waste, i.e. NACE 05-09, 10-12, 17-18 and 24-25. For other industries, the uncertainties are larger, especially in NACE G-U excl. 46.77.

Random errors are described under sampling errors below. Measurement errors and nonresponse are also considered to be random to some extent. Regarding bias, it is assumed to be negligible at the aggregated level for non-hazardous waste. This is because the mining industry accounts for most of the non-hazardous waste and the mining industry is subject to a total coverage survey. For hazardous waste, the main source of bias is the assumptions made regarding estimation of hazardous waste in NACE G-U excl. 46.77. However, we have not been able to quantify this potential bias.

5.2. Sampling error

Sampling errors may occur when a sample of the local units/facilities/enterprises that are included in the target population is surveyed. The error is due to the degree of variation in the data and can be controlled by choosing the appropriate sampling design. In sample surveys, the sampling errors are assessed by the coefficients of variation.

In cases where data on the generation of waste and treatment of waste have been produced from surveys (questionnaire or environmental reports as the data source), sampling errors (coefficients of variation) are estimated together with the estimates of population totals for each waste category. Surveys are used for estimation of waste generation in mining and quarrying and manufacturing industries. Web surveys were used for NACE 10-12, 17-18, 20-22, 23, 24-25 and 26-30. Environmental reports were used in NACE 05-09, 10-12, 17-18, 19, 20-22, 23, 24-25, 26-30, 38 and 46.77. For NACE 05-09, and 38.1-2 a total survey of environmental reports is the only data source, and hence there are no sampling errors in these industries.

In practice, the unit nonresponse is treated as being random. In the estimation process, the number of selected units in each stratum is replaced by the number of responding units (m_h in the formula below). This means that the unit nonresponse is reflected in an increased sampling error.

The variance is calculated according to the formula:

$$\hat{V}(\hat{t}_z) = \sum_{h=1}^{H} \frac{N_h^2}{m_h}\left(1 - \frac{m_h}{N_h}\right)\frac{1}{m_h - 1}\left[\sum_{k=1}^{m_h} z_{hk}^2 - \frac{\left(\sum_{k=1}^{m_h} z_{hk}\right)^2}{m_h}\right]$$

where

$\hat{t}$ = *point estimate*

H = *number of strata*

N_h = *population in stratum h*

m_h = *total responses in stratum h*

The mean error of the estimate is then calculated using

$$SE(\hat{t}) = \sqrt{\hat{V}(\hat{t})}$$

and the relative mean error (*rmf*) or coefficient of variation is calculated as

$$rmf = \frac{SE(\hat{t})}{\hat{t}}$$

In the tables reported, the variance coefficients are expressed as percent of the point estimate.

In sectors other than those mentioned above, sample surveys are not used and hence sampling error is not applicable for these sectors.

For disposal and recovery of waste all facilities with a permission to treat waste is surveyed by environmental reports, i.e. it is a total survey with no sampling error.

5.2.1. Sampling error – indicators

Uncertainties in key aggregates

Table 3 presents the key aggregates reported. For waste generation, coefficients of variation are calculated as the overall standard deviation from the sample surveys in relation to the estimated total amount of waste. Only aggregated data from administrative sources is used for waste generation from households, and hence there is no sampling error. The mining industry (NACE 05 – 09) accounts for 75% of the non-hazardous wastes generation from enterprises. Since no sample survey is conducted for this industry, the contribution to the sampling error is zero for non-hazardous waste.

The largest contributors to hazardous waste from enterprises are NACE F, G-UX46.77 and D. None of these industries are surveyed by means of a

sample survey, and hence the coefficient of variation is low (1%) also for generation of hazardous waste in enterprises.

For waste treatment, the coefficients of variation are zero because it is not a sample survey.

Table 3. Totals and coefficients of variation for the key aggregates in 2018.

Country: Sweden Reference year: 2018		Total hazardous waste (key aggregates), *Tonnes*	Total non-hazardous waste (key aggregates) *Tonnes*	Coefficient of variation hazardous waste *%*	Coefficient of variation non-hazardous waste *%*
Generation of waste					
1	**Households**	426 913	4 078 218	0	0
2	**Enterprises**	2 941 003	138 673 530	1	0
Recovery and disposal of waste					
1	**Incineration with energy recovery R1**	403 770	8 528 672	0	0
2	**Incineration as a means of disposal D10**	129 928	4 216	0	0
3	**Recovery R2-R11**	372 532	16 852 093	0	0
4	**Landfilling D1, D3, D4, D5, D12 Land treatment and release to water D2, D6, D7**	671 704	104 613 001	0	0

It has been assumed that the different sub-sectors are independent of one another when they are summed to the key aggregate. The standard formula for propagation errors can thus be applied:

$$U_{total} = \frac{\sqrt{(U_1 * x_1)^2 + (U_2 * x_2)^2 + ... + (U_n * x_n)^2}}{x_1 + x_2 + ... + x_n}$$

Where:

U_{total} is the percentage uncertainty for the total waste quantity

x_i is the incoming waste quantity

U_i is the percentage uncertainty for waste quantity x_i

For all the sub-categories that are not subject to sample surveys, $U_i = 0$. Waste treatment is surveyed by a total survey to all registered waste treatment facilities. Since it is a total survey the variation coefficient is 0.

5.3. Non-sampling error

In the Swedish reporting of waste statistics, sample surveys account for only part of the estimates and hence various types of non-sampling errors are the main contributors to the total survey error (TSE).

Non-response, coverage errors and erroneous and/or incomplete answers can cause non-sampling errors. Table 4 and

Table 5 below show the distributions of object status in the questionnaire survey and environmental report survey, respectively.

Response status	B05-B09	C10-12	C17-18	C19	C20-22	C24-25	C26-30	E38 + G4677	TOTAL
Valid response	19	109	57	15	198	28	198	123	842
Some items imputed	3	0	6	0	17	1	47	14	306
All items imputed	0	0	0	0	0	0	0	1	4
Env. report not accessible, imputation with data from WStatR2018	0	9	1	0	4	1	14	5	1
Env. report not accessible, imputation not possible	0	3	0	0	9	1	4	2	175
Env. report not complete, imputation not possible	0	12	0	0	18	6	51	28	27
Over coverage (closed before 2018)	0	1	0	0	1	0	1	1	30
Over coverage (not active in 2018)	6	3	0	0	2	0	3	1	50
TOTAL	28	137	64	15	249	37	318	175	1435
Proportion of missing or incomplete reports	11%	18%	11%	0%	19%	24%	36%	29%	36%
Over coverage rate	21%	3%	0%	0%	1%	0%	1%	1%	6%

Table 4. Distribution of object status in questionnaire survey (observation object=local unit)

Response status	C10-12	C17-18	C20-22	C23	C24-25	C36-30	Total
Valid response	39	36	62	35	52	139	363
Unit nonresponse, imputation with data from WStatR2018	9	6	0	0	12	0	27
Unit nonresponse, imputation not possible	114	40	75	40	130	208	607
Over coverage (closed before 2018)	2	1	0	0	0	0	3
TOTAL	164	83	137	75	194	347	1000
Response rate	24%	43%	45%	47%	27%	40%	36%
Over coverage rate	1%	1%	0%	0%	0%	0%	0%

Table 5. Distribution of object status in environmental reports (observation object=facility)

Response status	B05-B09	C10-12	C17-18	C19	C20-22	C24-25	C26-30	E38 + G4677	TOTAL
Valid response	19	109	57	15	198	28	198	123	842
Some items imputed	3	0	6	0	17	1	47	14	306
All items imputed	0	0	0	0	0	0	0	1	4
Env. report not accessible, imputation with data from WStatR2018	0	9	1	0	4	1	14	5	1
Env. report not accessible, imputation not possible	0	3	0	0	9	1	4	2	175
Env. report not complete, imputation not possible	0	12	0	0	18	6	51	28	27
Over coverage (closed before 2018)	0	1	0	0	1	0	1	1	30
Over coverage (not active in 2018)	6	3	0	0	2	0	3	1	50
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Over coverage rate	21%	3%	0%	0%	1%	0%	1%	1%	6%

5.3.1. Coverage error

Coverage errors regarding the population occur when the survey method results in:

- Waste generating enterprises or facilities are included in the target population, but not included (missing) in the frame population. This is known as “under-coverage”.
- The same enterprise or facility is included in several sub-surveys, or objects that were not active during the reference period are included in the frame population. This is known as “over-coverage”.

Coverage errors lead to waste quantities either being missed, counted twice, or overestimated due to over-coverage. Under- and over-coverage problems related to the population that have been detected in connection to the collection of data include:

- Local units with incorrect NACE codes in the business register.
- Out-of-date information in the business register or the environmental reports register (SMP) on local units or facilities that are no longer active (over-coverage) or new enterprises or facilities starting recently (under-coverage).
- Data on amounts of packaging waste is obtained from the official packaging waste statistics and allocated to households and NACE G-U excl. 46.77. If packaging waste is included in glass-, paper-, wooden or plastic waste in environmental reports or questionnaires, there is a risk for double counting.

To compile data adapted to the waste statistics regulation, different methods have been used for different activities. In the surveys for waste generation reaching 100% coverage has been aimed for by the following strategies/techniques:

- In sample surveys, waste generation in small local units below cut-off (less than 10 employees) has been covered by multiplying each reported amount of waste in enterprises with 10-49 employees by a factor defined as
$$\frac{number\ of\ employees\ in\ the\ population, 10-49\ employees}{number\ of\ employees\ in\ units\ above\ cutoff}$$
- When using waste factors to estimate generated waste, activity data that covers the whole industry have been used when applicable (e.g. working hours, number of employees). This is applicable for industries not surveyed by means of sample survey.
- In NACE 38.3 and 46.77, proportional adjustment to reach 100% coverage has been made. The adjustment factor has been assessed by number of employees.

In NACE 05-09, waste from NACE 08 is not covered. This has several reasons. Historically, very few environmental reports for this industry were available. In the business register, the sites are either part of a local unit included other economic activities, typically in NACE 23, or correspond to local units with less than 10 employees. This known deficit has not been prioritised, mainly because the contribution from NACE 08 to the waste generation from the group NACE 05-09 is negligible compared to NACE 07 and 09 (NACE 05-06 are practically not occurring in Sweden).

Depending on the size and activity, waste treatment facilities can be divided into three categories:

- "A facilities" require a permission from the Swedish environmental court. Larger waste incineration plants, landfill sites, composting plants, anaerobic digestion plants and industrial plants are A activities. All A activities are obliged to annually upload an environmental report with waste data to the Swedish Portal for Environmental Reporting (SMP).
- "B facilities" require permission from the county administrative boards. Other (smaller than A) waste incineration plants, landfill sites, composting plants, anaerobic digestion plants and industrial plants are B activities. All B activities are obliged to annually upload an environmental report with waste data to (SMP).
- "C facilities" require a registration to the local authority, usually the municipality. Examples of C facilities are some preparatory treatment and storage, and smaller facilities that use soils and mineral waste from construction and demolition for backfilling or

construction purposes. C facilities are generally not obliged to upload environmental reports to SMP.

In the survey of waste treatment all facilities with permission to manage waste are included in the frame and the survey. 1 767 facilities are included in the frame. Smaller facilities do not report to, or are registered in, SMP. Thus, Sweden lacks a comprehensive national data source/inventory that covers smaller facilities (estimated to more than 3 000 facilities) which were not included in the frame. Compared to facilities with permission, the registered activities are considered to be of less importance regarding amount of waste treated (on national total level), and their activities are mainly recovery, transfer and storage. These activities are not surveyed because of the lack of easily available data in combination with the assumption that they are of less importance when it comes to waste treatment. Recent pilot studies however, indicate that on a national total level, the licensed activities can, in fact, contribute to a non-negligible amount of treated waste for some waste categories (for example recovered soils and mineral waste from construction and demolition) and may have an effect on the recovery rate of these wastes. This will be further investigated for future WStatR-reportings and in ongoing governmental assignment on improving the Swedish waste statistics. The current aim is to launch a new reporting system ("Waste Register" in 2020-2021, which will cover both facilities with permission and registered facilities.

Determination of extractive waste generation

Table 6. Coverage of waste statistics with regard to extractive waste.

Coverage	Topsoil	Overburden	Waste-rock	Tailings (non-haz.)
Completely covered	X	X	X	X
Partially covered				
Generally excluded				

Different frames have been used in different surveys, i.e.:

- NACE 05 – 09 and NACE 10 - 33 are based on local units in the Statistics Sweden business register. This is matched with the register of environmentally hazardous activities in the Swedish Portal for Environmental Reporting (SMP), operated by the county administrative boards and the Swedish EPA. Two frames are constructed, one with local units matching a facility in SMP and one with the remaining local units. The former is used in the environmental reports survey and the latter used in the web survey. The object definitions are not identical, which can lead to coverage errors.

- NACE 38 and NACE 46.77 are based on register of environmentally hazardous activities in the Swedish Portal for Environmental Reporting (SMP), operated by the county administrative boards and the Swedish EPA. The frame for waste treatment consists of facilities with permits for the treatment of waste included in this database.
- The frame (for generated waste) of incineration plants in NACE 35 is based on the annual energy statistics survey (Electricity supply, district heating and supply of natural and gasworks gas 2018)

This may lead to over-coverage (object counted in several surveys) as well as under-coverage (objects in the target population missing in all frames used). The different frames have been checked against each other with the aim of detecting objects that have appeared in several of the frames. Any cases identified where data have appeared twice have been corrected. It is hence assumed that no data has been counted twice.

Local units have been used as observation unit in the surveys of manufacturing industries. In the surveys of NACE 05-09, 38 and 46.77 facilities were applied. A "facility", in this case, is a unit that has permission for environmental hazardous activities and is registered in SMP. Usually a facility is equivalent to local unit, but there are exceptions since the facility is based on the environmental hazardous activities and the local unit is based on the economic activities. There are examples where one local unit consists of two or more facilities (two separate permissions), as well as where one facility consists of two or more local units. This causes coverage problems in those sectors where the frame is based on the business register, i.e. local units, while the data is actually collected on facility level. We have tried to overcome this problem by checking that each local unit is only counted in one of the sub populations (web-survey or environmental reports population).

It happens that a facility is matched to several local units, coded as different activities (e.g. NACE 08 and 23), and the facility may represent each of the local units, or both/all of them. The waste must be allocated to one activity only, and the choice is made manually using information in the business register and the environmental report. This does not have any influence on the total amounts of waste, but may affect the distribution of waste between different activities.

Coverage rates in the questionnaire survey and environmental report survey, respectively, are shown in Table 4 and

Table 5 above.

Response status	B05-B09	C10-12	C17-18	C19	C20-22	C24-25	C26-30	E38 + G4677	TOTAL
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In NACE G-U excl. 46.77, there is substantial under-coverage. For example, the statistics on waste from harbours does not cover all harbours, which leads to large under-coverage mainly for the waste items 02A*, 10.2, 10.2* and 11. We also know that there is major under-coverage in the data used for waste from airports, medical care and distribution of newspapers. The under-coverage rate is not possible to quantify, mainly due to lack of documentation, and hence no compensation is possible. Waste data for NACE G-U excl. 46.77 are largely reused from WStatR2018.

There may be an under-coverage of recovery of soils and mineral waste from construction and demolition – smaller facilities do not need permission (only notification to the local authority), and they are not included in the survey of waste treatment. This will also have an influence of the generation of the corresponding secondary wastes.

Another possible under-coverage is when wastes, usually well-defined "clean" wastes, are used as fuel or raw material in industries. There are several examples where the industries do not report this as waste treatment in the environmental report. During several years there has been an attempt to identify these facilities, and today all major facilities should have been identified and are included in the survey.

The definition of waste has been interpreted according to European regulation and practices. After 2008 there has been a tendency towards classifying some rest-products as by-products instead of waste. This means that rest-products that have been included in the waste statistics before 2008 are no longer included. A difficulty is when a facility generating a rest-product and a facility receiving the rest-product classify the same rest-

product in different ways. Since waste generation and waste treatment are separate surveys, there are usually no possibilities to discover those discrepancies. It is a recognized task for the supervising and monitoring authorities to give guidance so the classifying of rest-products as waste or by-product becomes harmonized in all parts of the waste management chain.

5.3.2. Measurement error

Measurement errors can occur when incorrect data is received from respondents (in questionnaires or in environmental reports) and are not corrected during editing. Furthermore, estimated values have been permitted in the surveys. This can affect the precision of the reported quantities. In those cases were macro data is used, we have usually no insight into the measurement problems in the underlying data collection. Measurement errors may also affect macro data collected from business associations, but generally, information about suspected measurement errors in these data sources is not available.
The forms and the design of the survey have been discussed with the Board of Swedish Industry and Commerce for Better Regulation (NNR). The questionnaires have also been discussed with Statistics Sweden's questionnaire design department. This effort, which was carried out during WstatR2016, was made to eliminate risks of misunderstanding etc.

Data from environmental reports and web surveys are subject to review by micro editing rules. Certain combinations of waste type and activity that are unlikely to occur are flagged, as are extreme observations. Each object is given a score based on suspected errors (flagged by the editing rules) and expected impact on the statistical estimates (using design weight). All objects whose suspected errors are expected to have a significant impact are checked manually. In several cases, relatively large errors in the submitted responses/environmental reports have been detected. In addition, the output editing sometimes leads to correction of errors not detected in the micro editing. There can still be incorrect responses/data that have passed undetected, and the magnitude is difficult to quantify, but the micro- and output editing processes should detect all significant errors.

Classification errors

The information in the environmental reports is not always clearly reported. The information can sometimes be interpreted in different ways, for example classification of waste (e.g. when the waste is called only "sludge") or classification of treatment (e.g. the treatment may be called “recycling” both when it is a preparatory treatment, for example sorting, and when it is “final recycling”, for example use of metal scrap in a steel work).

The corresponding errors may also arise in questionnaire surveys. The respondents have to make the interpretation of which information that should be reported in the questionnaire and how, and there is an obvious risk for misunderstanding and misinterpretation.

In the questionnaires and in the use of environmental reports we have primarily used LoW (List of waste) codes to label the waste. However, in many cases, both in questionnaires and environmental reports, as well as in both waste generation and waste treatment, the respondents do not always apply the LoW classification, but use their own nomenclature, for example naming wastes as “other waste”, “rest waste”, “oil waste”,” sludge”, “combustible waste”, “landfill waste”, and similar. In these cases, there has been a manual reclassification to LoW. However, several waste types are difficult to unambiguously classify to LoW or EWC-Stat:

1. "Oil wastes" (waste that contains oil) can be classified under several different LoW codes that, in turn, can result in several different EWC-Stat categories such as 01.3H, 03.2H, 02H, 10.2H, and 08H.
2. "Sludge" can be classified in a lot of different ways giving different EWC-Stat categories such as Industrial effluent sludge (03.2), Sludges and liquid wastes from waste treatment (03.3) or Common sludge (11), but can also be other categories such as EWC-Stat 12, 09.2, 09.1, 02H, 01.3H.
3. “Ash” and “slag” can mean both EWC-Stat 12.4 and 12.8. In addition, ash and slag from waste incineration can be classified as both EWC-Stat 12.4 and 12.8 depending on if the waste incineration is regarded as co-combustion or incineration.
4. “Other wastes” and “rest wastes” is normally classified as EWC-Stat-code10.2, unless the environmental report provides further information. However, similar texts could have been other wastes.

During WStatR2018 there was a shift in methodology for the combustion facilities in Energy (NACE 35). This was described in the quality report on Waste Statistics 2018. In brief, the change lead to a shift between waste types EWC-Stat 12.4 and 12.8 and it is uncertain whether the shift is real or just an effect of the change in measurement method. Since waste data regarding WStatR2020 is extrapolated from the WStatR2018-survey, the same uncertainties remain in WStatR2020.

Errors in precision of quantities

Most waste quantities are based on weighing at the waste treatment facilities. In principle, all major waste management facilities are equipped with weighing-machines. Data from waste generators are usually based on

data achieved from the waste management facilities (for example invoices, individual annual report to customers or similar).

Conversion factors have been used if waste has been reported in other units than tonnes. Conversion factors have been obtained from data from respondents and other experts, including Swedish Waste Management (Avfall Sverige), official energy statistics, etc. Some of the conversion factors are not particularly controversial, such as tonne per m^3 of oil or tonne per m^3 of sludge. Problems have occurred when the waste has been reported as mixed, or when it was unknown whether the waste has been compressed or not. The same conversion factors have been used in all sub-surveys for similar wastes. Some waste types are sometimes given in number of items, for example refrigerators, freezers, fluorescent tubes, other sources of light, and similar. These have been converted to weight by different conversion factors.

5.3.3. Nonresponse error

The unweighted response rate for the web surveys on waste generation was 36% on the total level. The reason for the low response rate is probably that the questionnaire is not mandatory. However, on the aggregate level, the response rate is much better because all facilities with significant environmental impact were surveyed by environmental reports, where unit nonresponse (i.e. the environmental report is missing or does not include the relevant information) is rare, except among smaller facilities in NACE 24-25 and NACE 38+46.77.

Data from the survey regarding 2016 was used for imputation of unit nonresponse when possible, but usually a proportional adjustment to compensate for the non-response was made, that is, linear expansion within each stratum. Thus, it was assumed that each stratum is homogeneous and that the respondents are representative for the non-respondents. The non-response adjustment and the sample adjustment are made at the same time. Such adjustments have been made for the surveys in the manufacturing industry. Nonresponse- and sampling error has not been estimated separately, but the nonresponse error is reflected as a larger sampling error.

In the waste generation survey for NACE 38.1 and 38.2 there was non-response due to environmental reports with classified information or with missing information about waste generation. No compensation for these rare cases was made, and hence there is a small negative nonresponse bias in waste generation in NACE 38.

In addition, in the survey of waste treatment there was non-response due to environmental reports with classified information or with missing information about waste treatment. This also leads to a small negative nonresponse bias.

The description above concerns unit non-response. Item non-response can also occur. In NACE B 05-09, item non-response on mining waste has been imputed with data from Geological Survey of Sweden (SGU). Apart from this, no adjustment for item nonresponse has been made because it is not obvious which types of waste that should occur for a specific facility.

When making adjustments for non-response at least two different errors can occur:

1. Straight expansion within strata is based on the assumption that the responding and non-responding parts of the population have similar properties regarding the parameters that are surveyed, in this case waste generation. If this assumption is wrong and waste generation is systematically lower or higher in non-responding units than in the responding units used for estimation, straight expansion leads to over- or underestimation. It can also lead to errors in the distribution between waste types, if there are systematic differences between responding and nonresponding units.
2. Some of the objects in the sample could be extreme in some way. An extreme value together with a high design weight and/or low response rate implies a risk for errors. The result can be a large over-estimation of a particular type of waste. This risk for error is not easy to detect if the error is not so large that experienced waste and industry experts can detect it when checking various compilations. However, outliers have been reallocated to separate strata (with weight = 1) in order to avoid over estimation when straight expansion is used. The weights of the objects remaining in the original strata have been adjusted accordingly.

5.3.3.1. Unit non-response – rate

At the overall level, the unit non-response rate in the web-survey was 64%. (In Sweden, it is not mandatory to reply on the waste survey). For environmental reports, 169 of the 1023 reports in the mining & quarrying and manufacturing industries were missing or did not contain useful information.

Table 7. Response rate for web survey

NACE	Npop	Nsamp	Nresp	response rate	non-response rate
10-12	676	164	39	24%	76%
17-18	327	83	36	43%	57%
20-22	437	137	62	45%	55%
23	258	75	35	47%	53%
24-25	1 494	194	52	27%	73%
26-30	1 360	347	139	40%	60%
TOTAL	4 552	1 000	363	36%	64%

Npop=number of units in the population

Nsamp=number of units sampled

Nresp=number of responding units

In the waste generation survey for NACE 38 and 46.77, the number of surveyed facilities was 1 011, of which 542 generated waste and 145 facilities were reported as unit non-response. In addition to the non-responding objects, some of the treatment plants in NACE 38 and 46.77 generate no waste. Thus, they are not considered unit non-response. It was judged that the non-responses to a large part were from non-active facilities, and no adjustment was made. However, it is likely that some of the non-responding facilities have waste generation that should be included in the statistics.

Also, in the survey of waste treatment 1 767 facilities were surveyed of which 314 are reported as unit non-response. The non-responses are expected to large part have been from non-active facilities, and no adjustment was made. However, it is not impossible that some of the non-response facilities have waste treatment that should have been included in the statistics.

5.3.3.2. Item non-response – rate

The rate of item non-response is impossible to determine in this case, since it is often not obvious which types of waste that "must" be generated in a specific industry, and it is even more difficult to reveal if some rare wastes are missed. Generally, item non-response has been assumed to be not occurring, and hence the rate is zero. Units with obvious multiple item non-response, e.g. only reporting a couple of hazardous waste items and no non-hazardous ones, are not used in the estimation. Such objects are treated as unit nonresponse. There is a risk of a small negative bias due to item non-response, but the effect on the estimates is assumed to be negligible.

5.3.4. Processing error

Processing errors occur when the raw data are processed in various ways during the data production. The following processing errors can occur:

- **Editing errors.** In the surveys, all the submitted questionnaires and environmental reports are checked and data corrected if necessary. Minor errors have been corrected and some imputations have been carried out when data were missing.
- **Input errors.** The environmental reports are checked and reviewed in paper format or pdf format, and then the data has been entered into a database manually. When entering the data, a figure can be entered in the wrong place, or in the data entry itself (e.g. one digit too few or too many). The database has a built-in system to prevent some of the most common input errors (for example only approved classification codes for waste classification as well as treatment method given e.g. the economic activity).
- **Coding errors.** If a waste or treatment method is described in free text, the waste or treatment code must be assessed manually which could lead to coding errors. These errors can occur when the person reviewing the questionnaire or environmental report misunderstands the responses and makes an incorrect amendment.

The aim has been to reduce or avoid the above mentioned types of processing errors by an iterative process of micro- and macro-editing during and after the data collection. Controls have been made both before and after the input to the database.

The scripts used for estimation and table production are reviewed independently by two persons in order to detect errors.

5.3.4.1. Imputation – rate

Numbers of units per industry and survey for which all or some data is imputed are shown in Table 4 and Table 5 above. Rates in terms of amounts of waste have not been calculated as it is not systematically documented exactly which items that are imputed for partly imputed units.

In the survey of waste generation in NACE 38 and 46.77 the number of surveyed facilities was 1 011, of which all waste data was imputed for 1.

In waste treatment 1 767 facilities were surveyed, of which all waste data was imputed for 10 of them.

5.3.4.2. Common units – proportion

Ideally, there should be no common units (i.e. duplicates) since the web survey frame has been constructed as the complement to the register of

environmental hazardous activities (SMP). However, due to the different unit definitions, in total 9 units, i.e. less than 1%, sampled in the web survey showed to be included in SMP. This was dealt with by imputing the questionnaires with data from the environmental reports.

5.3.5. Model assumption error

Data from earlier surveys has been reused for some industries, or economic activities (NACE), which have shown to have only small amounts of waste, especially small amounts of hazardous waste. These industries and subcategories generally have small amounts of waste according to earlier surveys. It is to be expected that the waste quantities in these industries change over time, but these changes have a very small impact on the total flow of each waste type.

In e.g. NACE 01-03, 41-43 and G-U excl. 46.77, the data available covers only part of the population, and various assumptions have been made to estimate the amounts for the whole population. Typically, waste generation is assumed to be proportional to turnover, number of employees etc. but these assumptions have not been verified and may infer model error.

In NACE G-U excl. 46.77, hazardous waste generated in 2018 was not surveyed, so an assumption was made that the amounts were the same as in 2014. The estimated hazardous waste generated in 2014 was based on a survey that was sent to waste managing companies. The response rate was very low, and extrapolation to the target population was made by assuming a linear correlation between turnover and amount of waste collected from NACE G-U excl. 46.77. This is a rough assumption, and it has not been possible to verify it. Hence, the estimates of hazardous waste from NACE G-U excl. 46.77 and indeed at aggregate level is suspected to suffer from substantial uncertainties due to model assumption errors.

Waste from small enterprises

None of the surveys covers the entire population in the industries surveyed. Waste generated in local units with less than 10 employees is estimated by means of cut-off expansion.

Proportional adjustments

In NACE 38.3 and NACE 46.77 only major facilities were investigated (usually facilities that have permission to handle more than 10 000 tonnes of waste per year). A proportional adjustment based on the number of employees (metal facilities in one group and non-metal in another) has been made. This calculation is based on the assumption that the waste generation is the same per employee in small enterprises as in big enterprises.

Waste factors

The main problem with waste factors is that only one or a few factors that can affect the amount of generated waste is reflected by the factor. For example, if the factor is expressed as tonnes of waste per employee, the change in amounts of generated waste between two years only mirrors the change in number of employees and does for example not capture any measures taken to reduce the amount of waste generated per employee or improved sorting at source in different waste types.

Waste factors have been used in several cases. In some cases the factors are based on current measurements, e.g. household waste from enterprises. These factors can be regarded as rather accurate. In other cases data from case studies, e.g. bio-degradable wastes from shops and restaurants have been used to estimate waste factors, which may increase uncertainty.

5.3.6. Data revision

5.3.6.1. Data revision – policy

Normally, no data revisions are made unless specific and significant reasons exist, e.g. new standards or requirements from Eurostat.

5.3.6.2. Data revision – practice

When errors have been detected in the Eurostat review process, corrected data has been reported to Eurostat.

5.3.6.3. Data revision - average size

Generally, revisions are small.

5.3.7. Seasonal adjustment

Not relevant since the statistics only includes annual data.

6. Timeliness and punctuality

A general time schedule for the reporting according to the EU waste statistics regulation is shown in Table 8.

Table 8. Time schedule for reporting waste statistics

Activity	Start	Completed
Planning, preparations and supplementary method developments	October 2018	March 2019
Data collection and processing	April 2019	March 2020
Compilation of statistics	September 2019	March 2020
Compilation of checking documentation	April 2019	May 2020
Drafting of Quality Report	April 2020	May 2020
Final checking of statistics and documentation	February 2020	March 2020
Data processing (checks of accuracy, completeness etc.)	November 2019	March 2020
Drafting of national statistical report	November 2019	May 2020
Supplementary work, follow-up, archiving	April 2020	June 2020
Delivery of statistics and quality report to Eurostat		30 June 2020 or earlier
National publication of statistical reports and available statistics in public database		June 2020

6.1. Timeliness

6.1.1. Time lag - first result

The time lag between the end of the reference period and the publishing date is around 18 months.

6.1.2. Time lag - final result

Final results are submitted to Eurostat two weeks after the publishing date.

6.2. Punctuality

6.2.1. Punctuality - delivery and publication

All data and publications were delivered in time. No delays to report.

7. Accessibility and clarity

Statistics on waste generation and recovery and disposal of waste and the current quality report will be published on the website of the Swedish EPA[2], when reporting to Eurostat is complete. A report will be published in June 2020, in which the statistical material on waste generation and treatment in Sweden will be presented and discussed. For more detail compared to what is presented in the overarching report, statistics leaflets covering waste statistics in specific NACE:s (e.g. NACE 10) and waste types (e.g. C & D Waste), have been published during the spring of 2020 on the Swedish EPA:s website. The statistics on waste generation and treatment in Sweden will be available in Statistic Sweden´s public database.

The intention for this quality report is to be a resource for more advanced statistical users in order to increase clarity regarding methods and checking procedures.

The statistics have been produced according to the Official Statistics Act (SFS 2001:99) and the Public Access to Information and Secrecy Act (SFS 2009:400). Data collection from environmental reports is done according to The Swedish Environmental Code (SFS 2000:61) and EPA ordinance (NFS 2016:8).

7.1. Dissemination format - News release

Swedish EPA is responsible for dissemination formats, e.g. press releases relating to the publication of the report “Waste in Sweden 2018” as well as the statistics leaflets.

7.2. Dissemination format – Publications

Report: *Waste in Sweden 2018* will be published by Swedish EPA in June 2020.

Leaflets: Information on waste statistics in a number of selected NACE and for waste types have been published on the Swedish EPA:s website. These information leaflets present statistics on common waste types as well as trends in the given NACE:s. These are:

- Construction
- Electricity, gas, steam and air conditioning supply
- Households

[2] www.naturvardsverket.se

- Manufacture of food products

- Manufacture of paper and paper products

- Mining and quarrying

- Manufacture of basic metals and Manufacture of fabricated metal products, except machinery and equipment

- Manufacture of computer, electronic and optical products, Manufacture of electrical equipment, Manufacture of machinery and equipment n.e.c, Manufacture of motor vehicles, trailers and semi-trailers and Manufacture of other transport equipment

- Construction and demolition wastes

- Hazardous wastes

- Household waste

- Import and export of waste

7.3. Dissemination format - online database

7.3.1. Data tables – consultations

Data tables are published in Statistics Sweden's public database[3]. During the first four months of 2020, 852 requests were made. During the same time 6 103 API-requests were made regarding waste statistics from Statistics Sweden's database.

Extract of the waste statistics data is published in data tables on the Swedish EPA´s webpage.[4]

7.4. Dissemination format - microdata access

Not applicable. Micro data is confidential and no public use files are produced.

7.5. Documentation on methodology

7.5.1. Metadata completeness – rate

Not applicable.

7.5.2. Metadata – consultations

[3] http://www.scb.se/mi0305-en
[4] www.naturvardsverket.se

Not applicable.

7.6. Quality management – documentation

SMED has its own quality management documentation, which was used during the project.

7.7. Dissemination format – other

Not applicable.

8. Comparability

The regulatory framework and guidelines from Eurostat have been followed as far as possible. All surveys have been carried out to achieve 100% coverage of waste quantities. This should guarantee that the statistics are comparable with corresponding statistics from other member states. However, the following areas should be highlighted as somewhat problematic concerning comparability:

- The concept household waste contains, apart from waste generated by households, both in practice and legally, also includes similar waste from industries, shops, offices and other business. The majority of waste flows, such as bag and dustbin waste, packaging waste, electronic scrap, etc. contain both waste generated by households and waste from different operations. For every waste flow included in wastes from household, an assessment has been made by industry experts of how much originates from households and how much originated from businesses and other sources.
- The distinctions between waste and by-products have had considerable effects on the statistics and hence on comparability with other countries. Different countries may have different practices how to handle the by-products in the waste surveys.
- Local unit, establishment, facility, station have mostly been used as survey objects. A local unit, establishment, facility or station can have several different economic activities, one main activity and several secondary activities. In this case the entire local unit, establishment, facility, station has been classified by its main activity. For example, coking plants can be found at steelworks. Independent coking plants (not existing in Sweden) should be classified as NACE 19 and steelworks as NACE 24. In our survey, coking plants at steelworks have been classified as belonging to NACE 24, and the waste generated there has been allocated to NACE 24.
- Waste from NACE 13-15 and 31-33 and hazardous waste from NACE G-U excl. 46.77 was not surveyed regarding 2018. The statistics presented for these industries are, with the exception of discarded vehicles, in fact reused from 2016. This issue is discussed further in section 8.2.

8.1 Comparability – geographical

The same methods are used in across Sweden.

For mobile treatment equipment the generation of waste and the recovery and disposal of waste, have been reported where it has been used. Capacity

data have, however, been reported in the municipality where it is registered or permitted. Only a few mobile operations have been found in the surveys, so the locations of these facilities are not considered to have any significant impact on the total reported quantities of waste or treatment capacities.

Table 9. Description of classification used.

	Name of classification(s) used	Description of the classification(s) (in particular compatibility with WStatR requirements)
Economic activities	SNI 2007	National classification based on NACE REV 2. Four first digits identical.
Waste types	List of waste	Converted into EWC-STAT Ver. 4 with conversion key
Recovery and treatment operations	Disposal operations and Recovery operations (so-called R code and D code) according to Annex I and Annex II in the Waste Directive	Converted to recovery and disposal operations according to WStatR production guidelines. The national statistics is presented in a less aggregated form (recovery is presented in several classes)

8.1.1. Asymmetry for mirror flow statistics – coefficient

This measure has not been calculated.

8.2. Comparability - over time

The current survey WStatR2020 is mostly to the prior surveys WStatR2018, WStatR2016, WStatR2014 and WStatR2012. All surveys follow the guidelines from Eurostat, which means they should be comparable over time. However, some methodological improvements have the effect that the estimates for different years are not always comparable. These cases are described under *Major changes compared with previous year*, together with a description of observed major changes since last survey in 2016.

For a few industries with relatively low rates of waste generation, and for hazardous waste from the services, data is not collected for every reference year, but less frequent (typically every 4 years, but for some less important waste flows, templates based on up to 12 years old data have been used). This affects the comparability over time for NACE 01-03, 13-15, 16, 19, 20-22, 23, 26-30, 31-33 and hazardous waste in NACE G-U excl. 46.77. For these industries, interpretations and comparisons of trends are not meaningful. Waste amounts from NACE D35 in WStatR2020 is extrapolated from gross electricity supply in combination with waste amounts from WStatR2018.

Due to the new categories of EWC-Stat in the reporting and rearrangement of the sectors following the NACE revision, there were relatively large differences between WStatR2008 and WStatR2010.

There has also been some changes in methodology and interpretations as described in earlier quality reports. The amounts of rest products classified as by-products are increasing. Many rest-products that in more recent WStatR are reported as by-products were reported as waste in WStatR2006 and WStatR2008. For example, there are two waste types in the steel sector, which in the current and more recent surveys are classified as by-products: electric arc furnace slag and blast furnace slag. In the paper industry, bark and wood residues that are used as fuel have been reclassified as by-products. As mentioned earlier in this report, many of the reported estimates are associated with considerable uncertainties. This means that even if the results are comparable, it can be difficult to interpret the differences between reference years. The differences can, in some cases, reflect statistical uncertainties or different interpretations of for example by-products, and in other cases be due to actual changes in waste amounts.

Major changes compared with previous year

WASTE GENERATION

Note that amounts mentioned in the section *major changes with previous years* have been rounded to the nearest 100 tonne. Therefore amounts and percentages may not always add up.

NACE A (01-03)

An observed change was an increase between 2018 and 2016 in Animal and mixed food waste (09.1), 12.5 percent, which is deemed a reasonable change in the period and within the NACE. The largest decrease was metal waste, mixed iron and non-ferrous metals, (06.3), with a decrease of ca 25%. The decrease is mainly due to a decrease in reported data from a reliable source.

NACE B (05-09)

The largest waste category in this NACE category is 12.A (Other mineral wastes). Therefore, any difference in this category will drastically affect the total waste of the industry. Between 2016 and 2018, the amount of waste in category 12.A decreased by 6.1 million tons (around 6%), which is the largest absolute change that has been observed in this comparison. The decrease is considered the reasonable.

Other major changes have been observed for EWC categories 06.1 (increasing) EWC categories 02A*, 01.2* and 10.2 (decreasing). These changes are also considered correctly reported.

NACE C10-12

The sector is quite similar in total amount 2018 compared to 2016. The total amount of non-hazardous waste has changed from 866 000 tonnes to 699 000 tonnes. The hazardous waste has changed from 3 800 tonnes to 2 600 tonnes.

A change in classification from a fraction as hazardous in 2018, regarding 02A* chemical waste. This affects the enumeration for the entire type of waste. There seems to be difficulties to decide which metal code that should be used (06.1, 06.2 and 06.3), there are large variations among them if you compare 2014, 2016 and 2018. However, the amount of total metals are very similar; 9600 tonnes in 2014, 7800 tonnes in 2016 and 7 100 tonnes in 2018. There has been a decrease regarding 08A* discarded equipment, from 2016 to 2018. It is natural with a large variation, since companies can exchange equipment one year and another year they do not. There has been a decrease regarding 09.1 Animal and mixed food waste between 2016 and 2018. It seems that it e.g. goes to animal feed. These quantities thus become by-product and not waste. The difference is also concluded to be derived from facility-level differences in reporting between 2016 and 2018.

It is difficult for the sector to keep track of Household Waste (EWC 10.1) and mixed and non-differentiated materials (EWC 10.2). There is a certain risk that household waste (10.1) is reported under EWC state code 10.2 (together with combustible waste). This waste should not occur to a large extent for this sector, 10.2* mixed and non-differentiated materials. It is therefore ok with a small amount. This waste has decreased between 2016 and 2018.

Regarding 12.4 waste from incineration, a large amount of reported waste is not actually ash waste. The waste is now regarded as a sludge waste and thus the amount is reduced compared to 2016. Regarding 12A (12.2, 12.3 and 12.5) Other mineral wastes there has been a decrease compared to previous years. This is partly due to some reclassification of waste to by-products.

NACE C13-15

No major changes occurred, data reused.

NACE C16

No major changes occurred, due to data largely reused.

NACE C17-18

There are only small changes in the totals of non-hazardous waste in this sector in 2018 compared to data for 2016. Hazardous waste however has doubled since 2016, from about 13 000 tonnes to 26 000 tonnes in 2018. This is explained by an increase of EWC-code12.6* (hazardous soils). It is natural that this waste type fluctuates over the years. Non-hazardous soils, code 12.6, has decreased. It is natural that also this waste type varies over time.

There are also changes for other specific waste types. EWC-code 07.5, wood waste, has decreased from about 100 000 tonnes to 36 000 tonnes. This is partly because some reclassification between waste and by-product has occurred. EWC-code 12.7, dredging spoils, has increased from zero to 56 000 tonnes. The difference has been controlled and is derived from facility-level differences in reporting. For sludge codes 03.2 and 11, both these types has increased. When coding the waste it can be hard to distinguish between code 03.2 (Industrial effluent sludges) and code 11 (common sludges). Data from 2018 has been compared to 2016 and we have found amounts of sludges that maybe should have been coded differently in 2016. The coding of sludges is deemed correct in this reporting. Sludges and liquid wastes from waste treatment, code 03.3, has increased. This is partly explained by an error in unit in one report from 2016. Metallic ferrous waste, code 06.1, has decreased since 2016. This is due to one site that in 2016 had an unusually high amount of scrap. Plastic wastes (code 07.4) and 06.3 (metallic waste, mixed ferrous and nonferrous) have increased. Several sites have reported more waste than in 2016 for these waste types and the changes seem correct. It is hard to say why, one reason could be better sorting of separated plastic. Waste 12.8A has decreased from about 5 000 to 2 500 tonnes. 08.A*, hazardous discarded equipment, has decreased between reporting years. For this waste type, large variations can be expected since companies can change a large part of the equipment a certain year and not another year.

12A Other mineral waste: Increased somewhat, the change appears to be correct. For 12.1 Mineral construction waste, there has been an increase of 1 000 tonnes, a reasonable increase.

NACE C19

A change in classification lies behind the changes in 01.2* Acid, alkaline or saline waste and 03.2*. The change in classification comes from a clarification in the reporting and is now believed to be correct. In addition, as differences in dry matter play a part in this change in classification, a

significant difference in the amount results from this change. As the amounts are also allocated to different EWC stat codes, it further reduces the comparability.

The differences between 2016 and 2018 in reported amounts regarding the EWC codes 10.2.Mixed and non-differentiated materials, 02A Chemical waste, 02A*Chemical waste and 12.1 Mineral construction and demolition waste is due to clearer reporting in the environmental reports. The changes in 08A* Discarded equipment (excluding discarded vehicles, batteries and accumulators wastes) and 08.1* Discarded vehicles are deemed correct.

NACE C20-22

Total hazardous waste has increased from 111 900 to 176 300 tonnes. Total non-hazardous waste has decreased by about 60 000 tonnes. The total amount of generated waste is very stable between 2016 (when the same data as in 2014 was used) and 2018.

It has been four year since new data was collected in this industry, so changes are to be expected.

For 10.2 Mixed and undifferentiated materials waste has decreased by 40 000 tonnes which seems to be correct. The sampling error was large four years ago. For 12.4*, Combustion wastes, hazardous waste, there is a large increase by 34 000 tonnes. The change derives from a checked facility-level change in reporting. 12.6*, Soils, hazardous waste has increased by 33 000 tonnes. The majority comes from a site which did a large decontamination project in 2018. It is natural that this waste type fluctuates over the years. 02A* Hazardous chemical waste shows a decrease by 10 000 tonnes, which seems to be correct.

12A- Other mineral waste has decreased from 2016 to 2018. The change derives from a facility-level change, and is deemed correctly reported. Waste in 07.5 Wood has decreased by 8 000 tonnes. The change derives from a facility-level change, and is deemed correctly reported. For waste code 01.1*, Spent solvents, hazardous waste, the amount of waste has increased by nearly 8 000 tonnes. Sites with a lot of this waste type have been checked and the increase seems to be correct. For 09.2, Vegetal waste, waste has decreased considerably. The change derives from a facility-level change, and is deemed correctly reported. For 07.4 Plastic waste, an increase by 5 000 tonnes which seems to be correct and for 07.2 paper the decrease seems to be correct.

For 03.2 (Industrial effluent sludges) and 11 (Common sludges) the total amount 2014 (and therefore reported in 2016) of these two waste types were

5 300 tonnes, total amount reported in 2018 was 7 300 tonnes. Sites with large amounts of sludges have been controlled and the changes are judged to be correctly reported.

For 01.2* Acid, alkaline or saline wastes amount of waste has decreased. The change derives from a facility-level change in reporting. For 02A, Chemical waste, waste has increased by 3 000 tonnes which seems to be correct. The change derives from a facility-level change, and is deemed correctly reported.

For 10.3, Sorting residues, there has been a decrease, which is explained by changes at facility-level reporting. 10.1 Household and similar waste has increased from about 100 to 2 800 tonnes, which is deemed to be correct from the facility-level data.

For 12.6, Soils, waste has increased by 1 000 tonnes. It is natural that this waste type fluctuates over the years, depending on if a specific site performs, for example, some kind of construction work.

For waste code, 01.3*, Used oils, the increase seems correct as is also true for 03.2*, Industrial effluent sludges. For 01.2, Acid, alkaline or saline wastes, there has been a decrease by 600 tonnes. Sometimes it can be difficult, both for the companies and for producers of the statistics, to determine if chemicals wastes should be coded as 01.2 or 02A, which may explain the difference.

The increase of nearly 400 tonnes in 09.1, Animal and mixed food waste, is explained by large amounts from a site not included in the NACE 20-22 industry four years ago.

For 08A*, Discarded equipment, the reported value is correct for 2018. The comparative data for 2016 is not correct. It should also be 300 tonnes.

For 07.5* Wood wastes, there has been a decrease by 150 tonnes, which is a reasonable change.

The amount of waste in 12.1*, Mineral waste from construction and demolition, has decreased. It is natural that this waste type fluctuates over the years. For 12.4, Combustion wastes, there has been an increase caused by facility-level change in reporting.

For: 08A, 08.1*, 12.8A*, 10.3*, 12.8A and others: The fact that there are small amounts of these waste types, the NACE 20-22 industry was last included in the survey four years ago and there are sometimes large uncertainties, makes it reasonable to believe that the changes are correct.

NACE C23

In general, the amounts of generated hazardous and non-hazardous waste have decreased from the previous reporting. The generated hazardous waste has decreased from 5 200 tonnes to 3 700 tonnes (or 27 %), and the generated non-hazardous waste has decreased from 214 200 tonnes to 171 700 tonnes (or 20 %).

The data on reference year 2016 was reused from the reference year 2014, which was the last properly surveyed reference year. The changes reflect the developments from year 2014 to year 2018.

There are waste categories where the changes of the amounts point in the opposite direction. These results may reflect the actual situation, but also the respondents' ability to report the data. The following descriptions of the major changes covers the waste categories where the change exceeds 3 000 tonnes and the intervals of uncertainty year 2014 and year 2018 are not over-lapping.

12A (Other mineral wastes), has decreased from 95 000 tonnes year 2014 to 47 100 tonnes year 2018. The difference (47 900 tonnes) is deemed to be plausible and correctly reported. The result for the year 2018 is largely contributing to the decrease of the total generated non-hazardous waste in the NACE. 12.1 (Construction and demolition wastes) has increased from 10 500 tonnes year 2014 to 31 750 tonnes year 2018. The result for year 2018 has been verified in quality controls of the micro data.

10.2, Mixed and undifferentiated materials, has decreased from 29 800 tonnes year 2014 to 15 100 tonnes 2018. Some of the difference can be accredited to clearer coding of waste going into 10.1 and 10.2. 07.5 Wood wastes have decreased from 33 100 tonnes year 2014 to 20 800 tonnes year 2018. 12.6 Soils has decreased from 10 500 tonnes year 2014 to 2 800 tonnes year 2018. The decrease in these codes for the year 2018 is following the general decrease of total generated non-hazardous waste.

10.1 Household and similar wastes has increased from 50 tonnes year 2014 to 4 100 tonnes year 2018. The result for year 2018 has been verified in quality controls of the micro data. Some of the difference can be accredited to clearer coding of waste going into 10.1 and 10.2. 06.3 Metal wastes, mixed ferrous and non-ferrous has increased from 3 400 tonnes year 2014 to 6 500 tonnes 2018. The result for year 2018 has been verified in quality controls of the micro data.

NACE C24-25

The sum of non-hazardous waste has decreased with 39 000 tonnes, or 3% between 2016 and 2018. The reduction is partly explained by a reduction of 03.2 Sludges from industries, which has reduced by 29 000 tonnes. Other large reductions have been observed in the combined total of metal wastes (06.1-3), which has reduced by 60 500 tonnes. Waste from combustion wastes (12.4) have increased with 60 000 tonnes (6.5%).

The sum of hazardous waste has increased with 19 000 tonnes, or 11% between 2016 and 2018. The biggest waste category that contribute to this difference is the hazardous acid, alkaline or saline wastes (01.2*) that have increased with 27 000 tonnes (65%) while hazardous combustion wastes (12.4*) have decreased with 8 700 tonnes (10.3%). The changes are reasonable.

NACE C26-30

NACE 26-30 was last surveyed for WStatR2016. It is therefore the first time in four years the industry group is surveyed, which explains some of the differences between the 2016 and 2018 data.

On the aggregate level, this industry group has increased its waste with around 17%, from 0.78 Mton/year to 0.91 Mton/year. The total of non-hazardous waste has increased with 17% and the total of hazardous waste has increased with 5%. The largest amounts in the non-hazardous waste category were:

06.3 Metallic wastes, mixed ferrous and non-ferrous: 172 300 tonnes with an increase of 24% since 2014. The change has been corroborated using facility-level data. The change is reasonable. 12A (Other mineral wastes) 126 700 tonnes with an increase of 39% since 2014. Again, the change is deemed reasonable.

The largest amounts in the hazardous waste category were: 01.3* Used oils: 41 700 tonnes with a decrease of 17% since 2014. 02A* Chemical wastes: 22 900 tonnes with an increase of 45% since 2014. 01.2* Acid, alkaline or saline wastes: 17 100 tonnes with an increase of 352 % since 2014. All changes have been reviewed in the micro data and deemed correct.

NACE C31-33

No major changes occurred, data reused.

NACE D35

No major changes occurred. Waste amounts in WStatR2020 is estimated by extrapolation. Regarding combustion plants, the underlying energy statistics

only shows minor change in gross electricity supply between 2016 and 2018. This minor change is reflected in the waste statistics.

NACE E36, 37, 39

No major changes, due to that data are largely reused.

NACE E38 Waste collection, treatment and disposal activities; materials recovery; and G46.77 Wholesale of waste and scrap

The wastes reported as generated in E38 and G46.77 are to the predominant part secondary wastes generated from pre-treatment and treatment of wastes. The largest uncertainties depend on uncertainties in the interpretation of what is a secondary waste (that has changed properties in the treatment/pre-treatment) and what is waste that has only been stored and transferred (has not changed properties in the treatment/pre-treatment plant).

The explanations to the major changes are in many cases the same for G46.77 as for E38 because it is the same method and the same data sources that are used. A difference between E38 and G46.77, however, is that the calculated scale-up influences G46.77 more since the entire sector is concerned. In E38 only 38.3 is up-scaled (not 38.1-38.2).

The facilities investigated in E38 and G46.77 have been taken from the register of environmentally hazardous activities in the Swedish Portal for Environmental Reporting (SMP), operated by the county administrative boards and the Swedish EPA.

Overall, the change in the generation of total non-hazardous waste for NACE E38 has increased from 308 500 tonnes to 485 400 tonnes. This is an increase with 176 900 tonnes (57 %). This increase seems to be caused mainly by large increases in the generation of metal wastes (6.1, 6.2, and 6.3), other mineral wastes (12A) and mineral waste from waste treatment and stabilized waste (12.8A).

The generation of metal wastes (6.1, 6.2, 6.3) has increased from 1 024 400 tonnes to 1 765 500 tonnes. This is an increase by 741 100 tonnes (72 %). This increase seems to be mainly due to increases in secondary generation of metal wastes. The change has been verified in the facility-level reported data. Other large facilities have also reported increases.

The generation of other mineral waste (12A) has increased from 2016 to 2018. The change has been verified in the facility-level reported data.

The generation of mineral waste from waste treatment and stabilized waste (12.8A) has increased from 591 400 tonnes to 767 400 tonnes. This is an

increase by 176 000 tonnes (30%). The change has been verified in the facility-level reported data.

The total generation of hazardous waste for NACE E38 has increased from 5 881 600 tonnes to 6 729 200 tonnes. This is an increase by 847 600 tonnes (14 %). The increase seems to be mainly due to increases in mineral waste from waste treatment and stabilized waste * (12.8A*), chemical waste* (02A*) and acid, alkaline or saline wastes (01.3*).

The generation of mineral waste from waste treatment and stabilized waste (12.8A*) has increased from 13 000 tonnes to 157 400 tonnes. This is an increase by 144 400 tonnes (1 110 %). The change has been verified in the facility-level reported data. Some reclassification between from non-hazardous and hazardous may also explain the difference.

The generation of chemical waste* (02A*) has increased from 72 800 tonnes to 155 200 tonnes. This is an increase by 82 000 tonnes (113 %). The change has been verified in the facility-level reported data.

The generation of acid, alkaline or saline wastes (01.3*) has increased from 40 400 tonnes to 65 800 tonnes. This is an increase by 25 400 tonnes (63 %). The change has been verified in the facility-level reported data.

The total generation of hazardous waste for G46.77 has increased from 565 600 tonnes to 569 400 tonnes. This is an increase by 3 800 tonnes (1 %), which can be considered to be negligible when taken into account the uncertainty in the data.

The total generation of non-hazardous waste for G 46.77 has decreased from 49 600 tonnes to 35 400 tonnes. This is a decrease by 14 100 tonnes (29 %). This decrease seems to be mostly due to large decreases in the generation of discarded equipment (excl. discarded vehicles, batteries and accumulators) (08A) and wood waste (7.5). The decrease has been verified in the facility-level reported data. The generation of wood waste (7.5) has decreased from 2016 to 2018. This decrease seems to be mainly due to several facilities which reported data for the generation of wood waste in 2016 but not in 2018.

NACE F41-43

In total, 12.4 million tonnes of waste from the construction sector was generated during 2018, of which 11.7 million tonnes were non-hazardous and 644 000 tonnes hazardous. Compared to 2016, waste has increased by about 2.3 million tons and the amount of hazardous waste has increased by about 260 000 tons, which is in line with the total increase in waste.

Hazardous waste represents 5-7% of the total amount of waste for both 2016 and 2018.

Major changes are explained below:

Metals (06.1 - 06.3): there is a decrease by about 37%, which is difficult to explain given that the construction boom increased between 2016 and 2018. The downturn in the business cycle did not come until the end of 2018. It is difficult for sorting plants to determine the quantities that come from the construction industry. The amount of metal over 2012-2018 have varied among the years. This can probably be explained by the amounts reported being estimates (since metal does not have to be construction and demolition waste) from the sorting plants.

Paper (07.2): no amounts were reported in 2018.

Plastic (07.4): sorted plastic waste is 99% less than 2016, but is on par with the other previous years' collection of statistics. This is an error reporting in 2016.

Wood (07.5): increased by approximately 50% in 2016 to 2018. Genuine incineration plants report 570 875 tonnes, the rest is registered in intermediate storage. Normal variation that depends on the nature of the buildings and the combustion possibilities.

Waste containing PCBs (07.7*): increased by about 300% since 2016, but empirically we know that the PCB waste may differ between the years depending on the specific demolition objects that year.

Mixed and non-differentiated materials (10.2): reduced by about 80% since 2016, but this is an appropriate figure since the quantities of waste (cables and other contaminated metal) depend on the specific demolition objects you have that year.

Other mineral waste * (12.2, 3.5*): increased 225%, mainly asbestos. The difference is due to changes in how hazardous mineral waste was allocated between Services and Construction. In 2016 compared a larger part was allocated to Services, but in 2018 this amount was allocated to Construction.

Soil (12.6 and 12.6*): increased 65% and 133%. Here, there is a risk of double counting due to intermediate storage, while at the same time, large quantities are lost to registered facilities that do not issue environmental reports to SMP.

Dredging spoils masses (12.7, 12.7*): decreased by about 80-100%, which is a reasonable change. In 2016, several large dredging projects were carried out. 2016 was also an extended reporting year, meaning that all dredgers

must be reported (not just larger). These small dredges are not included in year 2018.

NACE G-U XG46.77

The total amount of generated waste 2018 decreased with 51 300 tons compared to 2016, corresponding to a decrease of about 2%. The amount of hazardous waste decreased by about 7% (equivalent to 28 500 tones) and the amount of non-hazardous waste decreased by about 1% (equivalent to 22 800 tones).

Seven waste types increased or decreased by more than 20%.

EWC 07.4 Plastic waste: Decrease due to methodical change. A larger proportion of plastic packaging waste is allocated to the household sector in WStatR2020 compared to WStatR2018.

EWC 07.5 Wood waste: Checked and considered accurate. There has been an increased amount of wooden packaging put on market compared to 2016.

EWC 07.6 Textile waste: Checked and considered accurate.

EWC 08.1* Discarded vehicles: Checked and considered accurate.

EWC 08.41* Batteries and accumulators wastes: Checked and considered accurate.

EWC 10.2* Mixed and undifferentiated materials and EWC 12.A* Other mineral wastes: Regarding 2016, the reported amount was C&D waste (generated in the service sector). The data was reused from a survey conducted for WStaR2014. In WStatR2020 the C&D waste is surveyed primarily in NACE F41-43. An un-known amount of C&D waste is generated in NACE G-U. However, regarding hazardous Mixed and undifferentiated materials and Other mineral wastes, the amounts is included as an un-known amount reported in F41-43. See also above for description in F41-43.

HOUSEHOLDS

Major changes in the amount of generated waste from households compared to 2016 are listed below:

Generated amounts of textile waste (EWC 07.6) collected at municipal recycling centers increased by almost 1 200 tonnes or 72 % compared to 2016. This increase may be explained by the fact that a higher number of recycling centers offer collection of textile waste to their citizens, and that a higher number of municipalities report the collected amounts.

The generated amounts of plastic waste (EWC 07.4) from households including plastic packaging waste and plastic waste collected at municipal recycling centers increased by over 23 000 tonnes or about 26 % compared to 2016. It is predominantly plastic packaging waste within the producer responsibility schemes that represents the increase. The increase is probably explained by a change of methodology for data from 2018 for how the amount of generated plastic packaging waste is calculated. The change of methodology likely means that a higher amount, and a more correct amount, of plastic packaging waste is included in the household sector.

The amount of discarded vehicles (EWC 08.1) increased by 11 % compared to 2016. A higher number of vehicles were discarded in 2018 compared to 2016.

The generated amount of medical waste (02A) increased by 29 % (around 300 tonnes) compared to 2016. A new data source was used for data from 2018, as the former was considered outdated.

WASTE TREATMENT

The major differences in waste treatment between 2016 and 2018 have four main explanations:

- real changes in amounts of treated waste,
- differences due to methodological changes or changes in interpretation,
- differences due to improved coverage rate and
- differences related to measurement errors.

Below is an overview of the largest changes observed for the treatment categories Recycling, Other recovery and Disposal and the underlying causes for the observed changes. Recycling, here means recovery where the same material is recycled (paper waste to paper, waste, rubber waste to rubber and so on). Other recovery means other recovery operation than recycling and backfilling, and includes energy recovery.

Recycling:

The total amount reported for the recycling of Acid, alkaline or saline wastes (01.2) has decreased from 91 200 tonnes to 7 400 tonnes. This constitutes a decrease by 83 800 tonnes (92%). This decrease is mostly due to a large decrease in conventional recycling of Acid, alkaline or saline wastes.

Conventional recycling of Acid, alkaline or saline wastes (01.2) has decreased by 76 000 tonnes (91 %). The change has been verified in the facility-level reported data.

The total amount reported for the recycling of Acid, alkaline or saline wastes* (01.2*) has decreased from 22 400 tonnes to 8 200 tonnes. This constitutes a decrease by 14 200 tonnes (63%). This decrease is mostly due to a large decrease in conventional recycling of Acid, alkaline or saline wastes *.

Conventional recycling of Acid, alkaline or saline wastes* (01.2*) has decreased by 14 160 tonnes (63 %). We judge that the amounts could have been counted double in 2016, based on how facilities report in their data. We consider the new numbers to be reasonable.

The total amount reported for the recycling of Chemical waste (02A) has increased from 500 tonnes to 6 800 tonnes. This constitutes an increase by 6 300 tonnes (1 261%). This increase is mostly due to a large increase in anaerobic digestion of Chemical waste.

Anaerobic digestion of chemical waste (02A) has increased with 6 300 tonnes (1 300 %). The change has been verified in the facility-level reported data. We judge this classification to be correct.

The total amount reported for the recycling of Chemical waste* (02A*) has decreased from 5 800 tonnes to 4 400 tonnes. This constitutes a decrease by 1 400 tonnes (24%). This decrease is mostly due to an increase in recycling of Chemical waste*.

Recycling of Chemical waste* (02A*) has decreased by 3 100 tonnes (69 %). This decrease is mostly due to a reclassification of the cleansing of packaging material. While previously classed as recycling/recovery, it is since 2018 not considered to be recycling anymore.

The total amount reported for the recycling of Industrial effluent sludges (03.2) has decreased from 36 000 tonnes to 18 400 tonnes. This constitutes a decrease by 17 600 tonnes (49%). This decrease is due to a large decrease in composting of industrial effluent sludges.

Composting of industrial effluent sludges (03.2) has decreased by 17 600 tonnes (49%). We have observed a continuous decrease since 2014 and judge the amounts to be realistic.

The total amount reported for the recycling of Sludge and liquid waste from waste treatment (03.3) has decreased from 1 281 tonnes to 0 tonnes. This constitutes a decrease by 1 281 tonnes (100%). This decrease is mostly due to both anaerobic digestion and composting of Sludge and liquid waste from waste treatment, which have decreased by 100 %. The decrease in composting is responsible for 99 % of the decrease.

Anaerobic digestion of Sludge and liquid waste from waste treatment (03.3) has decreased by 13 tonnes (100 %). The change has been verified in the facility-level reported data.

Composting of Sludge and liquid waste from waste treatment (03.3) has decreased from 1 300 tonnes to 0 tonnes. This constitutes a decrease by 1 300 tonnes (100 %). This decrease is due to several facilities which did not report any numbers for Composting of Sludge and liquid waste from waste treatment in 2018.

The total amount reported for the recycling of Metallic waste (mixed iron and other metals than iron) (06.3) has decreased from 44 900 tonnes to 17 600 tonnes. This constitutes a decrease by 27 300 tonnes (61%). This decrease is mostly due to a large decrease in other recovery of Metallic waste (mixed iron and other metals than iron).

Recycling of Metallic waste (mixed iron and other metals than iron) (06.3) has decreased by 26 200 tonnes (100 %). The change has been verified in the facility-level reported data.

The total amount reported for the recycling of Rubber waste (07.3) has decreased from 39 700 tonnes to ca 100 tonnes. This constitutes a decrease by 39 600 tonnes (99.7%). This decrease is mostly due to a large decrease in recycling of Rubber waste.

Recycling of Rubber waste (07.3) has decreased from 39 70 tonnes to 0 tonnes. This constitutes a decrease by 39 70 tonnes (100 %).The change has been verified in the facility-level reported data.

The total amount reported for the recycling of Plastic waste (07.4) has decreased from 83 600 tonnes to 50 900 tonnes. This constitutes a decrease by 32 600 tonnes (39%). This decrease is mostly due to a large decrease in conventional recycling of Plastic waste.

Conventional recycling of plastic waste (07.4) has decreased by 32 000 tonnes (39 %). The change has been verified in the facility-level reported data. There has been some reclassification from recycling, but which since 2018 are considered to be pre-treatment. We judge this to be the correct approach.

The total amount reported for the recycling of Mixed and undifferentiated wastes (10.2) has increased from 600 tonnes to 6 600 tonnes. This constitutes an increase by 6 000 tonnes (966%). This increase is mostly due to a large increase in anaerobic digestion of Mixed and undifferentiated wastes.

Anaerobic digestion of Mixed and undifferentiated wastes (10.2) has increased from 0 tonnes to 6 00 tonnes. This constitutes an increase by 6 000 tonnes (100%). The change has been verified in the facility-level reported data.

The total amount reported for the recycling of Sorting residues (10.3) has increased from 900 tonnes to 10 900 tonnes. This constitutes an increase by 10 000 tonnes (1 100%). This increase is mostly due to a large increase in anaerobic digestion and composting of sorting residues.

Anaerobic digestion of Sorting residues (10.3) has increased from 0 tonnes to 1 600 tonnes. This constitutes an increase by 1 600 tonnes (100%). One facility which did not report numbers for anaerobic digestion of Mixed and undifferentiated wastes in 2016 is responsible for the entire amount reported.

The total amount reported for the recycling of Mineral wastes from waste treatment and stabilized wastes (12.8A) has decreased from 7 300 tonnes to 0 tonnes. This constitutes a decrease by 7 300 tonnes (100%). This decrease is due to a decrease of 100 % in recycling of Mineral wastes from waste treatment and stabilized wastes.

The total amount reported for the recycling of Other mineral waste (12A) has decreased from 32 000 tonnes to 21 900 tonnes. This constitutes a decrease by 10 100 tonnes (32%). This decrease is mostly due to a large decrease in recycling of Other mineral waste.

Recycling of Other mineral waste (12.A) has decreased by 13 000 tonnes (70 %). The decrease is likely due to a reclassification of the waste type between other mineral waste and waste from incineration.

Other recovery

The total amount reported for other recovery of Acid, alkaline or saline wastes (01.2) has increased from tonnes 18 000 to 28 000 tonnes. This constitutes an increase by 10 000 tonnes (57 %). This increase is mostly due to increases in Land treatment and Use in construction of Acid, alkaline or saline wastes.

Land treatment of Acid, alkaline or saline wastes (01.2) has increased from 0 tonnes to 8 200 tonnes. This constitutes an increase by 8 200 tonnes (100%). The change has been verified in the facility-level reported data.

Use in construction of Acid, alkaline or saline wastes of Acid, alkaline or saline wastes (01.2) has increased from 11 600 tonnes to 19 800 tonnes. This is an increase by 8 200 tonnes (70%). The increase is due to several

facilities which did report any numbers for Use in construction of Acid, alkaline or saline wastes in 2016.

The total amount reported for other recovery of Oil waste* (01.3*) has decreased from 21 600 tonnes to 12 300 tonnes. This constitutes a decrease by 9 300 tonnes (43 %). This decrease is due to a large decrease in energy recovery of Oil waste*.

Energy recovery of Oil waste* (01.3*) has decreased by 9 300 tonnes (43 %). The change has been verified in the facility-level reported data.

The total amount reported for other recovery of Chemical waste (02A) has increased from 21 900 tonnes to 37 600 tonnes. This constitutes an increase by 15 700 tonnes (72 %). This increase is mostly due to a large increase in Use in construction of Chemical waste.

Recovery as construction material of Chemical waste (02A) has increased from 7 400 tonnes to 21 400 tonnes. This is an increase by 14 000 tonnes (190%). The change has been verified in the facility-level reported data.

The total amount reported for other recovery of Chemical waste* (02A*) has increased from 2 300 tonnes to 11 100 tonnes. This constitutes an increase by 8 900 tonnes (394 %). The increase is due to a large increase in of Chemical waste*.

Energy recovery of Chemical waste* (02A*) has increased with 8 900 tonnes (394 %). The change has been verified in the facility-level reported data. Some reclassification from hazardous oil waste* was reclassified to hazardous chemical waste* has occurred.

The total amount reported for other recovery of Industrial effluent sludges (03.2) has increased from 38 200 tonnes to 113 100 tonnes. This constitutes an increase by 74 900 tonnes (196%). This increase is mostly due to a large increase in energy recovery of Industrial effluent sludges.

Energy recovery of Industrial effluent sludges (03.2) has increased with 72 900 tonnes (205%). The amounts for the three largest facilities have been checked. The use of environmental reports that SMED currently uses to collect this data, makes it hard to identify data for Energy recovery of Industrial effluent sludges. We judge that it is possible that amounts for the Energy recovery of Industrial effluent sludges have been overlooked in previous years.

The total amount reported for other recovery of Sludge and liquid waste from waste treatment (03.3) has increased from 800 tonnes to 32 300 tonnes. This constitutes an increase by 31 500 tonnes (4 308%). This

increase is mostly due to a large increase in energy recovery of Sludge and liquid waste from waste treatment.

Energy recovery of Sludge and liquid waste from waste treatment (03.3) has increased from 0 tonnes to 35 200 tonnes. This constitutes an increase by 35 200 tonnes. The change has been verified in the facility-level reported data.

The total amount reported for other recovery of Sludge and liquid waste from waste treatment* (03.3*) has decreased from 6 800 tonnes to 3 800 tonnes. This constitutes a decrease by 3 000 tonnes (44 %). This decrease is mostly due to a large decrease in energy recovery of Sludge and liquid waste from waste treatment*.

Energy recovery of Sludge and liquid waste from waste treatment* (03.3*) has decreased from 6 800 tonnes to 3 800 tonnes. This constitutes a decrease by 3 000 tonnes (45 %). The change has been verified in the facility-level reported data.

The total amount reported for other recovery of Health care and biological waste (05) has decreased from ca 300 tonnes to 0 tonnes. This constitutes a decrease by 300 tonnes. This decrease is due to a decrease in energy recovery of Health care and biological waste. The change has been verified in the facility-level reported data.

The total amount reported for other recovery of Metal waste (iron) (06.1) has decreased from ca 100 tonnes to 0 tonnes. This constitutes a decrease by ca 100 tonnes. This decrease is due to a decrease in the Use in construction of Metal waste (iron). The change has been verified in the facility-level reported data.

The total amount reported for other recovery of Glass waste (07.1) has increased from 600 tonnes to 2 000 tonnes. This constitutes an increase by 1 400 tonnes (234%). This increase is mostly due to a large increase in Use in construction of Glass waste.

Use as construction material of Glass waste (07.1) has increased from 600 tonnes to 1 700 tonnes. This constitutes an increase by 1 100 tonnes (197%). The change has been verified in the facility-level reported data. We judge the increase to be reasonable based on the information received from the facility.

The total amount reported for other recovery of Paper and cardboard waste (07.2) has decreased from 1 200 tonnes to 300 tonnes. This constitutes a decrease by 900 tonnes (74 %). This decrease is due to a large decrease in energy recovery of Paper and cardboard waste.

Energy recovery of Paper and cardboard waste (07.2) has decreased by 900 tonnes (74 %). SMED judges that it is reasonable to observe a decrease in the Energy recovery of Paper and cardboard waste.

The total amount reported for other recovery of Rubber waste (07.3) has increased from 40 900 tonnes to 56 000 tonnes. This constitutes an increase by 15 100 tonnes (37%). This increase is mostly due to a large increase in energy recovery of Rubber waste.

Energy recovery of Rubber waste (07.3) has increased from 40 900 tonnes to 55 800 tonnes. This constitutes an increase by 14 900 tonnes (36 %). The change has been verified in the facility-level reported data.

The total amount reported for other recovery of Wood waste* (07.5*) has increased from 77 300 tonnes to 362 400 tonnes. This constitutes an increase by 85 100 tonnes (369%). This increase is mostly due to a large increase in energy recovery of Wood waste*.

Energy recovery of Wood waste* (07.5*) has increased with 85 100 tonnes (369%). The change has been verified in the facility-level reported data. Because of this change, the Energy recovery of Wood waste for this facility has increased by a factor 20.

The total amount reported for other recovery of Animal and mixed food waste (09.1) has decreased from 48 200 tonnes to 10 000 tonnes. This constitutes a decrease by 38 200 tonnes (79 %). This decrease is mostly due to a large decrease in energy recovery of Animal and mixed food waste.

Energy recovery of Animal and mixed food waste (09.1) has decreased by 33 200 tonnes (78%). The change has been verified in the facility-level reported data.

The total amount reported for other recovery of Vegetal waste (09.2) has decreased from 198 800 tonnes to 142 600 tonnes. This constitutes a decrease by 56 200 tonnes (28 %). This decrease is mostly due to a large decrease in energy recovery of Vegetal waste (09.2).

Energy recovery of Vegetal waste (09.2) has decreased by 45 000 tonnes (71%). The change has been verified in the facility-level reported data.

The total amount reported for other recovery of Animal faeces, urine and manure (09.3) has increased from 6 700 tonnes to 9 000 tonnes. This constitutes an increase by 2 300 tonnes (34%). The increase is due to a large increase in Land treatment of Animal faeces, urine and manure.

Land treatment of Animal faeces, urine and manure (09.3) has increased from 6 700 tonnes to 9 000 tonnes. This constitutes an increase by 2 300

tonnes (34%). The increase is due to several facilities which did not report numbers for Land treatment of Animal faeces, urine and manure in 2016, but did so for 2018.

The total amount reported for other recovery of Sorting residues (10.3) has decreased from 1 172 000 tonnes to 912 800 tonnes. This constitutes a decrease by 259 200 tonnes (22 %). This decrease is mostly due to a large decrease in energy recovery of Sorting residues.

Energy recovery of Sorting residues (10.3) has decreased from 1 047 300 tonnes to 786 000 tonnes. This constitutes a decrease by 261 300 tonnes (25%). This decrease is due to several facilities that did not report numbers in 2016 for Energy recovery of Sorting residues. The reported amounts are close to those reported in 2014.

The total amount reported for other recovery of Common sludges (11) has increased from 147 500 tonnes to 202 600 tonnes. This constitutes an increase by 55 100 tonnes (37%). This increase is mostly due to a large increase in Use in construction and energy recovery of Common sludges.

Use in construction of Common sludges (11) has increased from 13 900 tonnes to 44 000 tonnes. This constitutes an increase by 30 100 tonnes (216%). The increase is due to several facilities that did not report numbers for Use in construction of Common sludges in 2016.

Energy recovery of Common sludges (11) has increased from 22 700 tonnes to 30 100 tonnes. This constitutes an increase by 7 400 tonnes (33%). The increase is due to several facilities which did not report values for Energy recovery of Common sludges in 2016.

The total amount reported for other recovery of Waste from incineration (12.4) has increased from 553 400 tonnes to 720 000 tonnes. This constitutes an increase by 166 600 tonnes (30%). This increase is mostly due to an increase in Use in construction and backfilling of Waste from incineration.

Use in construction of Waste from incineration (12.4) has increased from 532 500 tonnes to 624 100 tonnes. This constitutes an increase by 91 600 tonnes (17%). This increase is mostly due to several facilities which did not report numbers for Use in construction of Waste from incineration in 2016 as well as several facilities which reported increased amounts compared to 2016.

Backfilling of Waste from incineration (12.4) has increased from 15 800 tonnes to 73 600 tonnes. This constitutes an increase by 57 800 tonnes

(365%). The increase is due to several facilities which did not report numbers for Backfilling of Waste from incineration in 2016.

The total amount reported for other recovery of Waste from incineration* (12.4*) has decreased from 6 300 tonnes to ca 100 tonnes. This constitutes a decrease by 6 200 tonnes (98 %). This decrease is due to a large decrease in Use in construction of Waste from incineration*.

Use in construction of Waste from incineration* (12.4*) has decreased from 6 300 tonnes to ca 100 tonnes. This constitutes a decrease by 6 200 tonnes (98%). The change has been verified in the facility-level reported data.

The total amount reported for other recovery of Soils (12.6) has increased from 2 555 900 tonnes to 3 774 800 tonnes. This constitutes an increase by 1 218 900 tonnes (48%). This increase is mostly due to increases in Use in construction and backfilling of Soils.

Use in construction of Soils (12.6) has increased from 2 400 100 tonnes to 2 977 500 tonnes. This constitutes an increase by 577 400 tonnes (24%). The change has been verified in the facility-level reported data.

Backfilling of Soils (12.6) has increased from 155 800 tonnes to 796 900 tonnes. This constitutes an increase by 641 000 tonnes (411%). The increase is due to several facilities which did not report numbers for Backfilling of Soils in 2016 but did so in 2018.

The total amount reported for other recovery of Soils* (12.6*) has increased from 110 600 tonnes to 190 100 tonnes. This constitutes an increase by 79 500 tonnes (72%). This increase is mostly due to large increases in the Use in construction and backfilling of Soils*.

Use in construction of Soils* (12.6*) has increased from 110 600 tonnes to 154 900 tonnes. This constitutes an increase by 44 300 tonnes (40%). The increase is due to several facilities which did not report numbers for Use in construction of Soils* in 2016.

Backfilling of Soils* (12.6*) has increased from 0 tonnes to 35 200 tonnes. This constitutes an increase by 35 200 tonnes (100%). The change has been verified in the facility-level reported data.

The total amount reported for other recovery of Dredging spoils (12.7) has decreased from 712 800 tonnes to 56 500 tonnes. This constitutes a decrease by 656 300 tonnes (92 %). This decrease is mostly due to large decreases in Use in construction and backfilling of Dredging spoils.

Use in construction of Dredging spoils (12.7) has decreased from 356 800 tonnes to 29 000 tonnes. This constitutes a decrease by 327 800 tonnes

(92%). The amounts of Dredging spoils vary strongly from year to year. The entire amount has been treated with backfilling.

The total amount reported for other recovery of Dredging spoils* (12.7*) has decreased from 600 tonnes to 0 tonnes. This constitutes a decrease by 600 tonnes. This decrease is mostly due to a large decrease in Use in construction of Dredging spoils*.

Use in construction of Dredging spoils* (12.7*) has decreased from 600 tonnes to 0 tonnes. This constitutes a decrease by 600 tonnes. The change has been verified in the facility-level reported data.

The total amount reported for other recovery of Mineral wastes from waste treatment and stabilized wastes (12.8A) has increased from 311 100 tonnes to 373 600 tonnes. This constitutes an increase by 62 500 tonnes (20%). This increase is mostly due to a large increase in Use in construction of Mineral wastes from waste treatment and stabilized wastes.

Use in construction of Mineral wastes from waste treatment and stabilized wastes (12.8A) has increased from 311 100 tonnes to 373 200 tonnes. This constitutes an increase by 62 100 tonnes (20%). The increase is due to a combination of several facilities which did not report numbers for Use in construction of Mineral wastes from waste treatment and stabilized wastes in 2016 and others which have reported larger amounts in 2018 compared to 2016.

The total amount reported for other recovery of Mineral wastes from waste treatment and stabilized wastes* (12.8A*) has decreased from 15 700 tonnes to 0 tonnes. This constitutes a decrease by 15 700 tonnes. This decrease is due to a large decrease in Use in construction of Mineral wastes from waste treatment and stabilized wastes*.

Use in construction of Mineral wastes from waste treatment and stabilized wastes* (12.8A*) has decreased from 15 700 tonnes to 0 tonnes. This constitutes a decrease by 15 700 tonnes (100%). The change has been verified in the facility-level reported data.

The total amount reported for other recovery of Other mineral waste (12A), excluding mineral waste from the mining sector, has increased from 167 400 tonnes to 212 200 tonnes. This constitutes an increase by 44 800 tonnes (27%). This increase is mostly due to large increases in Use in construction and backfilling of Other mineral waste.

Use in construction of Other mineral waste (12A), excluding mineral waste from the mining sector has increased from 50 000 tonnes to 88 000 tonnes. This constitutes an increase by 38 000 tonnes (76%).

Use in construction of Other mineral waste (12A), excluding mineral waste from the mining sector, has increased from 116 600 tonnes to 123 700 tonnes. This constitutes an increase by 7 100 tonnes (6%).

Disposal

The total amount reported for disposal of Acid, alkaline or saline wastes (01.2) has decreased from 14 500 tonnes to 7 600 tonnes. This constitutes a decrease by 6 800 tonnes (47 %). This decrease is mostly due to a large decrease in landfill of Acid, alkaline or saline wastes.

Landfill of Acid, alkaline or saline wastes (01.2) has decreased from 14 500 tonnes to 7 600 tonnes. This constitutes a decrease by 6 800 tonnes (47 %). This decrease is due to a combination of several facilities which did not report numbers for Landfill of Acid, alkaline or saline wastes in 2018 and a decrease for several facilities which reported data in 2018.

The total amount reported for disposal of Acid, alkaline or saline wastes* (01.2*) has decreased from 10 200 tonnes to 3 500 tonnes. This constitutes a decrease by 6 700 tonnes (66%). This decrease is mostly due to a large decrease in landfill of Acid, alkaline or saline wastes.

Landfill of Acid, alkaline or saline wastes* (01.2*) has decreased from 10 000 tonnes to 3 500 tonnes. This constitutes a decrease by (65 %). The change has been verified in the facility-level reported data.

The total amount reported for disposal of Oil waste* (01.3*) has decreased from 5 900 tonnes to 3 900 tonnes. This constitutes a decrease by 2 000 tonnes (34%). This decrease is mostly due to a large decrease in incineration of Oil waste*.

Incineration of Oil waste* (01.3*) has decreased from 5 900 tonnes to 3 900 tonnes. This constitutes a decrease by 2 000 tonnes (34%). The change has been verified in the facility-level reported data.

The total amount reported for disposal of Chemical waste* (02A*) has decreased from 138 800 tonnes to 103 700 tonnes. This constitutes a decrease by 35 100 tonnes (25%). This decrease is mostly due to a large decrease in incineration and landfill of Chemical waste*.

Landfill of Chemical waste* (02A*) has decreased from 20 000 tonnes to 3 100 tonnes. This constitutes a decrease by 17 000 tonnes (85 %). This decrease is due to several facilities which has not reported any numbers for Landfill of Chemical waste*.

Incineration of Chemical waste* (02A*) has decreased from 117 000 tonnes to 100 700 tonnes. This constitutes a decrease by 16 300 tonnes (14%). This

decrease is mostly due to one facility which reported much smaller amounts for Incineration of Chemical waste* in 2018 than in 2016.

The total amount reported for disposal of Industrial effluent sludges (03.2) has decreased from 5 600 tonnes to 1 700 tonnes. This constitutes a decrease by 3 900 tonnes (69%). This decrease is mostly due to a large decrease in landfill of Industrial effluent sludges.

Landfill of Industrial effluent sludges (03.2) has decreased from 5 600 tonnes to 1 500 tonnes. This constitutes a decrease by 4 100 tonnes (73 %). The change has been verified in the facility-level reported data.

The total amount reported for disposal of Health care and biological waste (05) has increased from 1 000 tonnes to 1 800 tonnes. This constitutes an increase by 800 tonnes (77%). This increase is mostly due to large increase in incineration of Health care and biological waste. The change has been verified in the facility-level reported data.

The total amount reported for disposal of Health care and biological waste* (05*) has decreased from 4 500 tonnes to 2 700 tonnes. This constitutes a decrease by 1 800 tonnes (41%). This decrease is mostly due to a large decrease in incineration of Health care and biological waste*. The change has been verified in the facility-level reported data.

The total amount reported for disposal of Metal waste (iron) (06.1) has increased from 200 tonnes to 500 tonnes. This constitutes an increase by 300 tonnes (107%). This increase is mostly due to an increase in landfill of Metal waste (iron).

Landfill of Metal waste (iron) (06.1) has increased from 200 tonnes to 400 tonnes. This constitutes an increase by 200 tonnes. The change has been verified in the facility-level reported data. This waste type can be hard to classify and is likely not pure metal waste.

The total amount reported for disposal of Metallic waste (mixed iron and other metals than iron) (06.3) has decreased from 300 tonnes to close to zero tonnes. This constitutes a decrease by close to 300 tonnes (almost 100%). This decrease is mostly due to a decrease in landfill of Metallic waste (mixed iron and other metals than iron).

Landfill of Metallic waste (mixed iron and other metals than iron) (06.3) has decreased from 333 tonnes to 0 tonnes. The change has been verified in the facility-level reported data.

The total amount reported for disposal of Wood waste (07.5) has decreased from 5 600 tonnes to 800 tonnes. This constitutes a decrease by 4 800

tonnes (86%). This decrease is mostly due to a large decrease in incineration of Wood waste.

Incineration of Wood waste (07.5) has decreased from 5 600 tonnes to ca 100 tonnes. This constitutes a decrease by 5 500 tonnes (99%). The change has been verified in the facility-level reported data. SMED could have misclassified this in 2016, when it could have been classed as energy recovery instead.

The total amount reported for disposal of Wood waste* (07.5*) has decreased from 40 000 tonnes to 600 tonnes. This constitutes a decrease by 39 400 tonnes (99%). This decrease is mostly due to a large decrease in incineration of Wood waste*.

Incineration of Wood waste* (07.5*) has decreased from 40 000 tonnes to 600 tonnes. This constitutes a decrease by 39 400 tonnes (99%). This decrease is due to a reclassification of incineration of hazardous wood waste to energy recovery.

The total amount reported for disposal of Textile waste (07.6) has decreased from ca 50 tonnes to 0 tonnes. This constitutes a decrease by ca 50 tonnes. This decrease is mostly due to a decrease in landfill of Textile waste.

Landfill of Textile waste (07.6) has decreased from ca 50 tonnes to 0 tonnes. The change has been verified in the facility-level reported data.

The total amount reported for disposal of Waste containing PCBs* (07.7*) has decreased from 500 tonnes to 200 tonnes. This constitutes a decrease by 300 tonnes (56%). This decrease is due to a decrease in incineration of Waste containing PCBs*. The change has been verified in the facility-level reported data. Amounts for Waste containing PCBs* vary strongly between years.

The total amount reported for disposal of Animal and mixed food waste (09.1) has decreased from 600 tonnes to 200 tonnes. This constitutes a decrease by 400 tonnes (66%). This decrease is mostly due to a decrease in incineration of Animal and mixed food waste.

Incineration of Animal and mixed food waste (09.1) has decreased from 500 tonnes to 100 tonnes. This a decrease of (76%). The change has been verified in the facility-level reported data.

The total amount reported for disposal of Vegetal waste (09.2) has increased from 0 tonnes to 1 300 tonnes. This constitutes an increase by 1 300 tonnes (100%). This increase is mostly due to a large increase in incineration of Vegetal waste.

Incineration of Vegetal waste (09.2) has increased from 0 tonnes to 1 300 tonnes. This constitutes an increase by 1 300 tonnes (100%). The change has been verified in the facility-level reported data.

Landfill of Household and similar wastes (10.1) has decreased from 26 700 tonnes to 7 200 tonnes. This a decrease of 19 400 tonnes (73 %). This decrease is due to several facilities which did not report numbers for Landfill of Household and similar wastes in 2018.

The total amount reported for disposal of Mixed and undifferentiated wastes* (10.2*) has increased to 22 700 tonnes by an increase of 14 900 tonnes (190%). This increase is mostly due to a large increase in landfill of Mixed and undifferentiated wastes*.

Landfill of Mixed and undifferentiated wastes* (10.2*) has increased from 5 600 tonnes to 22 400 tonnes. This constitutes an increase by 16 800 tonnes (303 %). The increase is due to several facilities which did not report numbers for Landfill of Mixed and undifferentiated wastes* previously and one facility which has reported much larger amounts in 2018 than in 2016.

The total amount reported for disposal of Sorting residues (10.3) has decreased from 243 700 tonnes to 164 300 tonnes. This constitutes a decrease by 79 400 tonnes (33%). This decrease is mostly due to a large decrease in landfill of Sorting residues.

Landfill of Sorting residues (10.3) has decreased from 243 700 tonnes to 164 300 tonnes. This constitutes a decrease by 79 400 tonnes (33%). The change has been verified in the facility-level reported data.

The total amount reported for disposal of Mineral waste from construction and demolition (12.1) has decreased from 338 100 tonnes to 74 900 tonnes. This constitutes a decrease by 263 200 tonnes (78%). This decrease is mostly due to a large decrease in landfill of Mineral waste from construction and demolition.

Landfill of Mineral waste from construction and demolition (12.1) has decreased from 337 800 tonnes to 74 600 tonnes. This constitutes a decrease by 263 200 tonnes (78 %). The change has been verified in the facility-level reported data.

The total amount reported for disposal of Mineral waste from construction and demolition* (12.1*) has decreased from 36 400 tonnes to 25 800 tonnes. This constitutes a decrease by 10 600 tonnes (29%). This decrease is mostly due to a large decrease in incineration of Mineral waste from construction and demolition*.

Incineration of Mineral waste from construction and demolition* (12.1*) has decreased from 19 500 tonnes to 3 800 tonnes. This constitutes a decrease by 15 700 tonnes (80%). This decrease is due to a combination of several facilities which did not report numbers for Incineration of Mineral waste from construction and demolition* in 2018.

The total amount reported for disposal of Waste from incineration (12.4) has increased from 408 700 tonnes to 528 900 tonnes. This constitutes an increase by 120 200 tonnes (29%). This increase is mostly due to a large increase in landfill of Waste from incineration.

Landfill of Waste from incineration (12.4) has increased from 406 200 tonnes to 516 600 tonnes. This constitutes an increase by 110 400 tonnes (27 %). The change has been verified in the facility-level reported data.

The total amount reported for disposal of Waste from incineration* (12.4*) has increased from 8 700 tonnes to 12 300 tonnes. This constitutes an increase by 3 600 tonnes (41%). This increase is mostly due to an increase in landfill of Waste from incineration*.

Landfill of Waste from incineration* (12.4*) has increased from 8 600 tonnes to 12 300 tonnes. This constitutes an increase by 3 700 tonnes (43 %). This increase is mostly due to several facilities which did not report numbers for Landfill of Waste from incineration* in 2016.

The total amount reported for disposal of Dredging spoils (12.7) has decreased from 642 700 tonnes to 336 600 tonnes. This constitutes a decrease by 306 100 tonnes (48%). This decrease is mostly due to large decreases in landfill and other disposal of Dredging spoils.

Landfill of Dredging spoils (12.7) has decreased from 225 700 tonnes to 106 900 tonnes. This constitutes a decrease by 118 800 tonnes (53 %). The amounts of Dredging spoils vary strongly from year to year.

Other disposal of Dredging spoils (12.7) has decreased from 417 000 tonnes to 229 700 tonnes. This constitutes a decrease by 187 300 tonnes (45%). The amounts of Dredging spoils vary strongly from year to year.

The total amount reported for disposal of Dredging spoils* (12.7*) has increased from close to zero tonnes to 19 300 tonnes. This constitutes an increase by 19 300 tonnes. This increase is mostly due to an increase in landfill of Dredging spoils*.

Landfill of Dredging spoils* (12.7*) has increased from close to zero tonnes to 19 300 tonnes. This constitutes an increase by 19 300 tonnes. The change has been verified in the facility-level reported data.

The total amount reported for disposal of Mineral wastes from waste treatment and stabilized wastes (12.8A) has increased from 12 900 tonnes to 59 900 tonnes. This constitutes an increase by 47 000 (365%). This increase is mostly due to a large increase in landfill of Mineral wastes from waste treatment and stabilized wastes.

Landfill of Mineral wastes from waste treatment and stabilized wastes (12.8A) has increased from 12 800 tonnes to 36 000 tonnes. This constitutes an increase by 23 200 tonnes (181 %). The increase is due to several facilities which did not report numbers for Landfill of Mineral wastes from waste treatment and stabilized wastes in 2016.

The total amount reported for disposal of Other mineral waste* (12A*) has increased from 23 900 tonnes to 32 900 tonnes. This constitutes an increase by 9 000 tonnes (38%). This increase is mostly due to a large increase in landfill Other mineral waste*.

Landfill of Other mineral waste* (12A*) has increased from 23 900 tonnes to 32 900 tonnes. This constitutes an increase by 9 000 tonnes (38 %). The change has been verified in the facility-level reported data.

8.2.1. Length of comparable time series

The time series for reference years 2010-2018 is overall comparable. For some waste types interpretation of what is a waste or a by-product has been problematic, which may have affected the results somewhat.

8.3. Comparability - domain

The estimates of waste generated in mining, manufacturing industries and energy production are reasonably comparable across domains, because the methodology is consistent and response rates and data quality is quite similar across industries. Despite the fact that some of the industries are surveyed less frequently, as described in section 8.2, the relative magnitudes are quite stable over time and the methodology is consistent. For other domains, e.g. NACE A, F, G-U excl. 46.77 and households, the comparability is poorer since a broad range of methods are used and a number of independent assumptions are made in different domains.

9. Coherence

9.1. Coherence - cross domain

9.1.1. Coherence - sub annual and annual statistics

Not relevant. No sub annual or annual waste statistics is produced in Sweden.

9.1.2. Coherence - National Accounts

The same classifications and frames are used in most business surveys and economic statistics at Statistics Sweden.

9.2. Coherence - internal

Efforts are made to avoid double counting and data gaps, but it could still occur to a limited extent. There are some discrepancies between total amounts of treated and generated waste. These differences for WStatR2020 have been handled and for the majority of the discrepancies explanations, e.g. amount of import and export of different waste types, have been found.

10. Cost and burden

Estimates made in WStatR2014 and earlier, indicate an average response burden of 1 hour per respondent in questionnaire surveys. In WStatR2020, environmental reports have been the major data source, and they are not connected to any extra burden for the respondents, as these are mandatory for other purposes than waste statistics. In the case of web surveys, there is an extra burden for the 363 respondents, which we estimate to 363 hours in total.

Since reference year 2016, it is mandatory for facilities that receive construction and demolition waste to report amounts and treatment of received construction and demolition waste, which has increased the burden. The reason was mainly to improve the evaluation of the Waste Framework Directive 2008/98/EC aim to have 70% of construction and demolition waste recycled by 2020. A contributing reason was also the need of improvement of the quality of the official statistics. SMED has also collected data from organisations and authorities that collect waste data for their own purposes, independently of the WStatR work. This work is not included Table 10.

Table 10. Burden of respondents

Survey / Source	Type and total number of respondents	Actual no. of respondents	Time required for response[5]	Measures taken to minimise the burden
NACE 10-12 (web survey)	164	39	39	Cut-off values applied in the sampling process in order not to burden small business. The survey is not mandatory, which is reflected in very low response rate and probably significantly decreases the burden.
NACE 17-18 (web survey)	83	36	36	
NACE 20-22 (web survey)	137	62	62	
NACE 23 (web survey)	75	35	35	
NACE 24-25 (web survey)	194	52	52	
NACE 26-30 (web survey)	347	139	138	
NACE 41-43 – mandatory reporting of received construction and demolition waste	560	560	560	-
TOTAL	**1 560**	**923**	**923**	

[5] 1 h per respondent

11. Confidentiality

11.1 Confidentiality – policy

Data is treated according to the Public Access to Information and Secrecy Act (2009:400).

11.2. Confidentiality - data treatment

The p% rule is used for primary cell suppression. The software TauArgus is used for statistical disclosure control. Some complementary secondary suppressions are added manually (i.e. cells that were suppressed for 2016 and where data is reused are suppressed also in 2018, which in a few cases causes additional suppressions. In these cases, we have applied a principle of preferably choosing cells with particularly uncertain estimates, e.g. in NACE G-U X46.77, for the complementary secondary suppression).

12. Statistical processing

12.1 Source data

12.1.1 Institutions involved and distribution of tasks

Table 11 shows the institutions involved and distribution of tasks within WStatR2020.

Table 11.Institutions involved and distribution of tasks.

Name of institution	Description of key responsibilities
Swedish Environmental Protection Agency	Responsible for producing, publishing and reporting national waste statistics. Responsible for the Swedish Portal for Environmental Reporting (SMP). The register covers all activities that has permission to environmentally hazardous activities according to the Environmental Code and is updated continuously by the county administrations. At the portal yearly environmental reports from facilities are available.
SMED consortium	SMED is an acronym of "Swedish Environmental Emissions Data", which is a collaborative consortium involving the four organizations IVL Swedish Environmental Research Institute, Statistics Sweden, Swedish University of Agricultural Sciences and Swedish Meteorological and Hydrological Institute. The waste statistics and documentation have been produced by SMED (only IVL Swedish Environmental Institute and Statistics Sweden have been involved) at commission of the Swedish EPA.
Other primary data collectors	Organisations, enterprises, agencies, etc. have made own inquiries or surveys from their members. SMED has collected data from them and compiled the data to reporting format.
• Swedish Waste Management (Avfall Sverige)	Swedish Waste Management is the trade association for municipal waste companies and municipalities. They make yearly surveys of household waste generation and treatment through inquiries to municipalities. In addition, domestic hazardous waste is included in their survey.
• Material companies for packaging and newsprint	Companies working with collection and recycling of packages and newsprint according to the producer’s responsibility legislation. They have provided data concerning generated and treated packaging.
• El-Kretsen	El-Kretsen is responsible organisation for collection and recycling of electric end electronic products. They collect and publish data about collection of WEEE.
• Swedish Tyre Recycling Association (SDAB, Svensk Däckåtervinning)	Swedish Tyre Recycling Association is a producer's responsibility organisation responsible for collection and recycling of tires. They collect and publish data about collection and treatment of scrap tyres.
• Swedish Steel Producer's Association (Jernkontoret)	Swedish Steel Producer's Association is a trade organisation that organises the major steel mills. They make a yearly survey on waste generation from its members. They provide reference data for crosschecking and validation.
• Swedish Forest Industries Federation (Skogsindustrierna)	Swedish Forest Industries Association is a trade organisation that organises the major pulp and paper mills. They make a yearly survey on waste generation and treatment from its members. They provide reference data for crosschecking and validation. For 2018, the data was unable to be used for validation, as the Swedish Forest Industries Association had not released the numbers in time.
• Board of Swedish Industry and Commerce for Better Regulation (NNR)	Specification of requirements for inquiries, e.g. recommendation of scope and layout of inquiries.

In preparation for the current reporting, the work has been organised as in Figure 1.

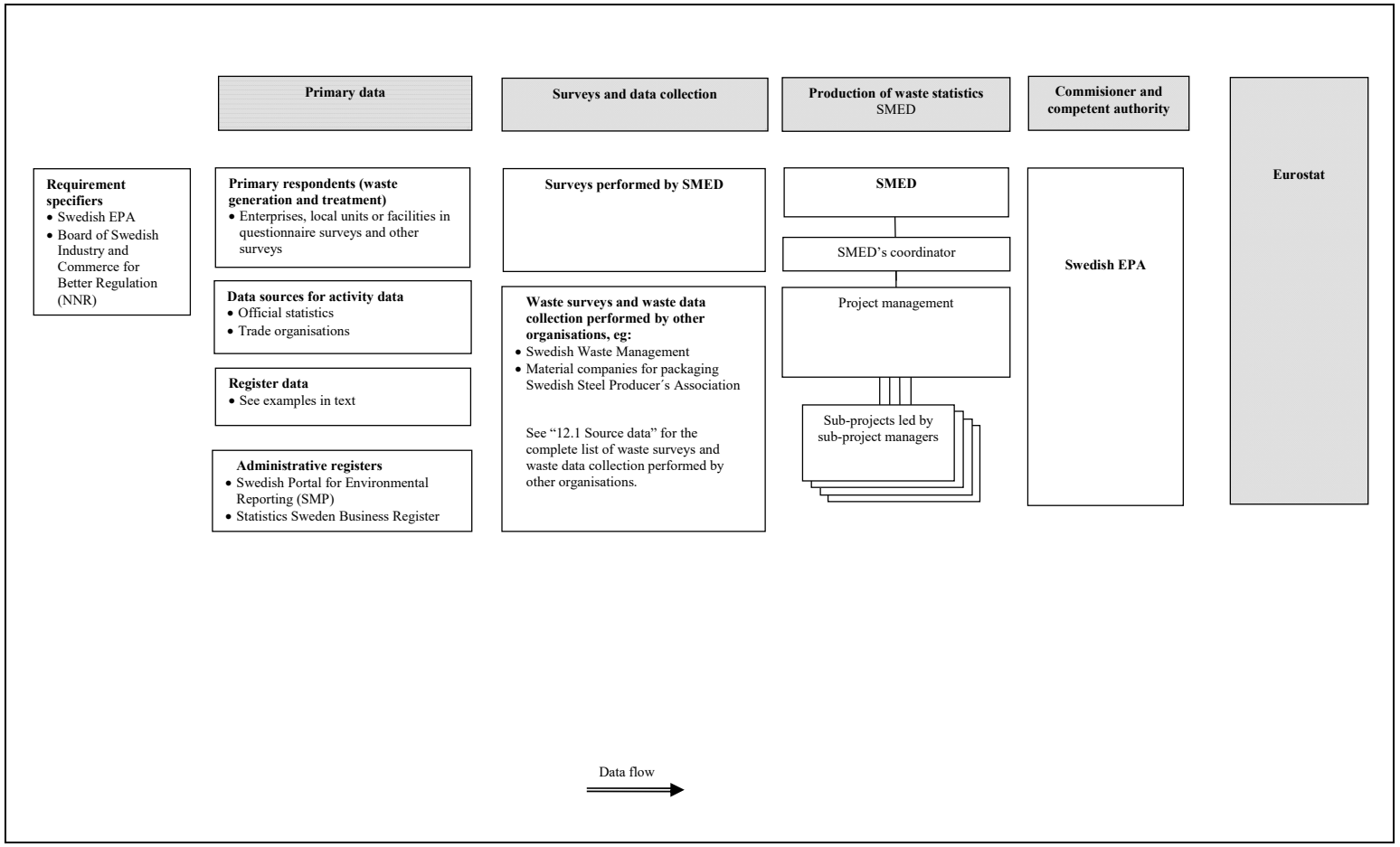

Figure 1.Description of the parties involved for data collection, processing and presentation.

12.1.2. General description of which methods are used in which part of the data set

Data set 1: Waste generation by waste category (EWC-Stat) and economic activities (NACE)

General description of methodology

Several methods have been combined to collect data. When selecting methods, a starting-point has been to prioritise good quality of statistics for flows of hazardous waste and large flows of waste that have been associated with environmental or resource issues. Another starting point has been to reduce the burden of respondents.

Data on waste generation and waste treatment has as far as possible been checked against other administrative data and other sources, e.g. Avfall Sverige (Waste Management Sweden), trade organisations, earlier surveys and other international reporting, such as packaging waste, ELV, dredging spoils, etc.

In the survey, environmental reports were used as a data source. The environmental report is a legal requirement, and it is one of the instruments that the authorities can make use of in order to inspect an environmentally hazardous activity. The information in the environmental report is expected to be of high quality and does not increase the burden of respondents.

In Table 14, an overview of the methodologies used is given. It should be emphasized that there are usually several methods used in each industry or sector. For example a web survey can be the main method, but model calculations are used for small enterprises (less than 10 employees). Some NACE sectors may also consist of several sub sectors, where different methods have been used for different sub sectors. The methods indicated in Table 14 are the major methods used.

Determination of waste generation in the economy on the basis of information on waste collection

Information from waste collection has not been used.

Determination of waste generation in the economy on the basis of administrative sources

Environmental reports

The most common administrative source in the WStatR-production work for Sweden is environmental reports. Statistics from different industries are based on the register of environmentally hazardous activities in The Swedish Emission Reporting Portal (SMP). It is operated by the county

administrative boards and the Swedish EPA, and covers facilities with permits for environmentally harmful operations according to the Environmental Code. Facilities with permits for treatment of waste were selected from this database. Information on treatment and generation of waste was extracted manually from the text reports and registered in the WStatR production database. Obvious coding- and unit errors were corrected.

A new method for WStatR2018 and WStatR2020 is that facilities with permits for waste treatment have to make a separate report for received construction and demolition wastes (wastes according to chapter 17 in the list of waste). These separates reports include LoW codes for waste, treatment method (R- and D-code according to the Annex I and Annex II in the waste framework directive), and secondary wastes aroused during sorting, mechanical treatment and other pre-treatment.

End-of-Life-Vehicle

Statistics Sweden and the Swedish Agency for Transport Policy Analysis publish statistics about registration of vehicles, including private cars, Lorries, cars, buses, trailers, semi-trailers, caravans, motorbikes, mopeds class 1, tractors, snowmobiles. In addition, the organisation registration number (VAT number) of the owner, in the case of private car the birth registration number, is registered as well as the kerb weight of each vehicle. All changes in the ownership, as well as deregistering are reported to the register continuously.

A search in the register was made to extract all information about all deregistered vehicles, including organisation registration number of the last owner and the kerb weight that were deregistered during 2018. It was assumed that the main reason for deregistering is that the deregistered cars have been handed over to an authorised car dismantling facility[6]. There may be some or exceptional reasons for deregistering, e.g. export of private car, or sole use of the car on private property, but we have judged these occurrences negligible.

The organisation registration number was linked and matched with the business register. In this way, the weight of deregistered vehicles for each NACE was obtained, including households for vehicles owned by private persons.

Data sets 2 and 3: Waste treatment, general description of methodology

[6] It should be mentioned that occasional deregistration is not included.

Waste treatment occurs in several economic sectors. The waste treatment in all sectors has been covered in a coordinated survey. The survey included facilities registered as waste treatment plants in the register of environmentally hazardous activities. In addition, industrial facilities with treatment of waste are included in the register. Environmental reports were used as data sources.

Identification of relevant treatment facilities

The registers used for identification of waste treatment plants are presented in Table 12. The register of environmentally hazardous activities is used as the main frame. The other registers have been used to check the completeness.

Table 12.Registers used for identification of waste treatment operations.

Identification of register(s) used	**Description of register**
Environmentally hazardous activities (responsible: Swedish EPA and the county administrative boards)	The register covers all activities that have permission to environmentally hazardous activities (according to the Environmental Code). The register is obtained through SMP The Swedish Portal for Environmental Reporting. It is updated continuously by the county administrative boards.
Facilities for household waste (responsible: Avfall Sverige /Waste Management Sweden)	Avfall Sverige (Waste Management Sweden) is a trade organisation where municipalities, municipality-owned waste companies and private waste companies are members. They keep a record of facilities that manage household wastes. The register covers all waste facilities that incinerate, compost, digest or landfill household waste. It is updated yearly through a survey to the municipalities. The register is voluntary.
Business Register (responsible: Statistics Sweden)	All types of legal forms with some kind of economic activity are included in Statistics Sweden's business register. Earlier surveys have shown that waste treatment facilities, especially facilities run by municipalities, often cannot be identified as waste treatment facilities from the register. (The municipal waste treatment plants are often incorporated in other municipal activities and difficult to identify).
Records from earlier WStatR surveys (responsible: SMED)	The databases from the earlier surveys contain the treatment plants that have been identified in the earlier surveys.

The waste treatment facilities were identified by their activity code in the register of environmental hazardous waste activities. Both primary codes and secondary codes were assessed. All facilities with incineration, landfilling and biological treatment of more than 50 tonnes per year are in the register as well as other treatment facilities for sorting, mechanical treatment and so on. Treatment facilities for household waste were also identified by information from the trade organisation Avfall Sverige (Waste Management Sweden), see Table 12.

Some types of waste are legally used as fuel in industrial or energy facilities or used as raw materials in manufacturing processes without waste treatment

permits. These facilities cannot be identified by their activity code. Most of them have been identified in earlier surveys or in connection with the waste generation surveys, but there may be a few facilities that are not included.

From the registers 1 767 facilities with potential waste treatment were identified. Pre-treatment plants and sorting plants were included in this figure. The register also contained some non-active facilities, for example older facilities that have closed down but still were registered, or new facilities with new permits or licenses that still were in the planning or construction stage.

The register of waste treatment plants included all facilities with a permitted or licensed treatment capacity of more than 50 tonnes/year of incineration, landfilling and biological treatment, and other treatment. Treatment plants with lower capacity have been excluded. Smaller plants that use soils and mineral waste for backfilling or for construction purposes are excluded. As already mentioned, there are also facilities in manufacturing industry that use different wastes or rest products as raw material in their production without being registered as waste treatment facilities. We have tried to identify as many as possible of these (for example in connection with the waste generation surveys), but there may still be under-coverage.

The register of all permitted or licensed waste treatment plants does not contain any facilities with permission to release waste to water. However, we have judged that release to water occurs mainly from facilities already in the register (for example landfills releasing leachate water), or from industries that are studied in the waste generation survey (in which also treatment not included in our register was looked for). There is also information from earlier surveys about facilities with release of waste into water.

Data collection on treated quantities

An overview of methods and sources for waste treatment is shown in Table 13.

Table 13. Determination of treated waste quantities.

Description of data sources and methods by treatment categories					
Item 1 Incineration (R1)	Item 2 Incineration (D10)	Item 3a Recycling (R2 – R11)	Item 3b Backfilling	Item 4 Landfilling (D1, D5, D12)	Item 5 Other disposal (D2, D3, D4, D6, D7)
Environmental reports Supplementary data for household waste facilities were obtained from Avfall Sverige (Waste Management Sweden)	Environmental reports	Environmental reports In a few cases, data were also obtained from the facility by telephone or mail contact. Supplementary data for household waste facilities were obtained from Avfall Sverige (Waste Management Sweden)	Environmental reports	Environmental reports In a few cases, data were also obtained from the facility by telephone or mail contact when data were missing in the environmental reports. Supplementary data for household waste facilities were obtained from Avfall Sverige (Waste Management Sweden)	Environmental reports Other disposal of Dredging spoils: from the reporting according to Helcom and OSPAR

The data on treated quantities were collected as follows:

1. Data from the HELCOM and OSPAR reporting were used for dredging spoils dumped at sea. In connection with the HELCOM and OSPAR, reporting a special survey was made about other treatment of dredging spoils (backfilling and landfilling) which are not covered by environmental reports.
2. For all other treatment, environmental reports were used.
3. The environmental reports were available digitally through the Swedish Portal for Environmental Reporting (SMP). The content in the environmental report is regulated by a decree from the Swedish EPA. There is no standardized reporting of waste treatment, but the decree states that the environmental report shall contain "production data". Facilities that receives construction and demolition wastes (defined according to chapter 17 in the List Of Wastes) have to

report treatment method (R and D code) and waste code (LoW) for the received CD waste)

4. If the environmental report was not available, or if it contained no usable data about treatment, we reused data from earlier environmental reports, or data from WStatR2018 (reference year 2016 was 6), or in some cases by contact with the facility.

Data from more than 90% of the facilities were obtained. No adjustment due to non-response (that is if no environmental report was available) was made, since it was judged that the non-responding facilities in most cases did not have any activity of importance in 2018.

When evaluating the environmental reports, the following information was extracted from the environmental reports:

- Treatment method and pre-treatment. The treatment “Other recovery than energy recovery” was divided into composting, anaerobic digestion, material recycling, use as construction material) and other recovery.
- Waste type (List of Waste) and quantity treated (in tonnes).
- Waste generated at treatment plant (used for the waste generation survey in NACE 38 and 46.77). Both primary and secondary wastes were investigated.
- Capacity of facility, when required. When the capacity or the permitted treatment quantity was not given in the environmental report, a model calculation was used, assuming that the facility worked close to the upper capacity or permission.
- All facilities were identified with a code giving the location on NUTS3 level.

The amounts of treated waste and the capacity were then summarised. The number of plants in each NUTS 2 region was also counted.

We have earlier found that it is difficult to survey recovery in manufacturing industries. The respondents often have a broad concept of "recovery", and in earlier questionnaire surveys, it was found that respondents often classify different kind of pre-treatment as "recovery" and "recycling". For the WStatR-production, statistics is classified as "final" recovery or recycling when the waste cease to be a waste and is transposed to a new product, material or construction. Often industries do not classify that as recovery or waste treatment, they regard it as use of secondary raw materials. Special efforts have been made to survey the real "final" recovery and recycling, and to exclude different kinds of pre-treatment and sorting.

Data collection on capacity of treatment facilities

Data on capacity were collected from the environmental reports parallel with the data collection on waste treatment, see above.

Primarily, capacity is equivalent to licensed capacity for waste treatment. When the licenses capacity was not applicable, the "technical capacity" for treatment facilities was identified and used for the reporting.

The environmental report shall contain information about given permits and production data. However, the permits are usually expressed in terms that are difficult to convert to terms that are used on WStatR-production:

- Landfill capacity is often given as height of landfill, area of landfill, permission to landfill the waste that has been generated (for industrial landfills), allowed landfilling per year, etc.
- Some integrated plants with several treatment methods (e.g. landfilling, composting and sorting) sometimes have a permission to manage a certain amount of waste per year, without any specification on each treatment methods.
- For energy facilities, maximum quantity of supplied fuel in energy units (for example MW or MWh per year) is often used, which is not relevant to describe the annual incineration or use as fuel of waste at the facility.

When relevant capacity data have been missing, the following principles to estimate the capacity have been employed:

- For landfilling, we used the latest available data from the landfill directive reporting, adjusting for the landfilled amounts of waste. It should be observed that landfill for mining waste is not included in the landfill directive reporting, but is in the WStatR reporting.
- For other treatment methods, it was assumed that the permitted capacity is approximately the same as the treated quantity, i.e. that the facilities receive close to the maximum quantity of waste allowed.

The number of facilities in different regions has been retrieved automatically from the database.

12.2. Frequency of data collection

Data on waste generation is collected every second year for households and most industries. However, a few industries which generate very small amounts of waste are surveyed less frequently, e.g. NACE 13-15, 16, 19, 20-22, 23, 26-30 and 31-33. This also applies to hazardous waste from the service sector (NACE G-U X46.77), despite the fact that these amounts of

waste are relatively large. Data on waste treatment is collected every second year.

12.3. Data collection

Prior to each WStatR-production round, all relevant data sources are listed, e.g. environmental reports and data from business associations. For the manufacturing industry, a sample survey is also carried out as described in Annex 2 Waste generation in the economy – sample survey . In order to minimize response burden and optimize the use of resources, some industries are surveyed less frequently as described above. The data collection period for the web survey is mainly April-June, but a few facilities are given respite. Data collection from environmental reports and other administrative sources takes place in April- February.

12.4. Data validation

In WStatR2020 Sweden implemented a new data validation tool for generated waste, which compares the values for 2018 to previous years' values according to facility and waste type. The validation takes into account the impact of the change to the total value per waste type. This has been done in effort to use the labour resources most efficiently, and to objectively validate the data.

When external reference data sources have been available, these have been used for validation of WStatR data.

12.5. Data compilation

All input data is stored in a database. Estimation for each activity item is made by a standardized script. Statistical disclosure control is made when all data is in place.

12.6. Adjustment

No adjustments are made.

13. Comment

No comments.

14. Related metadata

No related metadata.

Annex 1. Description of methods for determining waste generation

An overview of applied methods is presented in Table 14. The methods are described in the following Annexes.

Table 14. Description of methods for determining waste generation.

	Item	1	2	3	4	5	6	7	8	9	10	11	12	13		14		15	16	17	18	19
	NACE	01-03	05-09	10-12	13 - 15	16	17 - 18	19	20 - 22	23	24 - 25	26 - 30	31 - 33	35	36	37	39	38	41 - 43	G - U, excl. 46.77	46.77	HH
01.1H		Mix of methods	Environmental reports	Environmental reports, Web survey	Reuse of data	Mix of methods	Environmental reports, Web survey	Environmental reports	Environmental reports, Web survey	Environmental reports, Web survey	Environmental reports, Web survey	Environmental reports, Web survey	Reuse of data	Mix of methods.	Reuse of data	Sewage sludge from official statistics, other waste factors	Reuse of data	Mix of methods, Principally Environmental reports	Mix of methods, principally information in environmental reports from facilities that receive C & D waste.	Mix of methods	Mix of methods	Mix of methods
1.2																						
01.2H																						
..																						
..																						
..																						
..																						
..																						
..																						
..																						
..																						
..																						
12.8, 13																						
12.8H, 13H																						

Annex 2 Waste generation in the economy – sample survey

The business register was used as base for the sampling, except for NACE 38 and NACE 46.77 where the register of environmentally hazardous activities was used. Local unit has been used as statistical unit. A local unit can have several different activities, one main activity and several secondary activities. The entire local unit has been classified by its main activity. Local unit is used because in most cases, the entire local unit has a common waste management and local unit is often equivalent to facility registered as environmental hazardous activities. Those facilities have to make a yearly environmental report which usually contains waste data.

Several data sources were used in the survey:

- The main data source has been environmental reports from facilities that are registered as environmentally hazardous activities according to the Environmental Code. These reports were available as PDF-files at the website Swedish Portal for Environmental Reporting (SMP). In NACE 05-09 and NACE C19, the environmental reports are the only data source since all relevant facilities are registered as environmentally hazardous activities.
- For some industries, units not registered as environmentally hazardous, data was also collected by web-questionnaires, see below. The local units covered by environmental reports were excluded from the sample frame to the web survey that was based on the business register.

Number of statistical units per stratum and item according to the available register, number of statistical units selected for sample survey and questionnaire sent out and number of non-responses are not shown due to risk of disclosure.

In the following tables, units are divided into six different size classes according to the numbers of employees:

Size classes	Numbers of employees
:1	10-19
:2	20-49
:3	50-99
:4	100-249
:5	250-499
:6	500 and upwards

NACE 10-12

Questionnaire survey	NACE 10-12												
	10:1	10:2	10:3	10:4	10:5	11:1	11:2	11:3	12:1	12:2	12:3	12:4	12:5
Valid response	39												
Unit nonresponse, imputation with data from WStatR2018	9												
Unit nonresponse, imputation not possible	114												
Over coverage (closed before 2018)	2												
Total	164												
response rate	24%												
Over coverage rate	1%												

NACE 17-18

Questionnaire survey	NACE 17-18									
	17:1	17:2	17:3	17:4	17:5	18:1	18:2	18:3	18:4	18:5
Valid response	36									
Unit nonresponse, imputation with data from WStatR2018	6									
Unit nonresponse, imputation not possible	40									
Over coverage (closed before 2018)	1									
Total	83									
response rate	43%									
Over coverage rate	1%									

NACE 20-22

Questionnaire survey	NACE 20-22													
	20:1	20:2	20:3	20:4	20:5	21:1	21:2	21:3	21:4	21:5	22:1	22:2	22:3	22:4	22:5
Valid response	62														
Unit nonresponse, imputation with data from WStatR2018	0														
Unit nonresponse, imputation not possible	75														

Over coverage (closed before 2018)	0
Total	137
response rate	45%
Over coverage rate	0%

NACE 23

Questionnaire survey	NACE 23					
	23:1	23:2	23:3	23:4	23:5	23:6
Valid response	35					
Unit nonresponse, imputation with data from WStatR2018	0					
Unit nonresponse, imputation not possible	40					
Over coverage (closed before 2018)	0					
Total	75					
response rate	47%					
Over coverage rate	0%					

NACE 24-25

Questionnaire survey	NACE 24-25								
	24:1	24:2	24:3	24:4	25:1	25:2	25:3	25:4	25:5
Valid response	52								
Unit nonresponse, imputation with data from WStatR2018	12								
Unit nonresponse, imputation not possible	130								
Over coverage (closed before 2018)	0								
Total	194								
response rate	27%								
Over coverage rate	0%								

NACE 26-30

Questionnaire survey	NACE 26-30				
	26:01 – 26:06	27:01 – 27:06	28:01 – 28:06	29:01 – 29:06	30:01 – 30:06
Valid response	139				
Unit nonresponse, imputation with data from WStatR2018	0				
Unit nonresponse, imputation not possible	208				
Over coverage (closed before 2018)	0				
Total	347				
response rate	40%				
Over coverage rate	0%				

Annex 3. Waste generation in the economy on the basis of information on waste treatment

Data for waste generation in Construction (NACE 41-43) has been based on information from waste treatment facilities. All waste treatment facilities and with permission to manage waste that receive construction and demolition waste have to report type of waste (LoW code) for the C&D waste (defined according to chapter 17 in the List of Wastes), waste treatment (R and D code), amount and in case of mechanical treatment and sorting also generated secondary wastes. These data are used to estimate the total amount of construction and demolition wastes (chapter 17 in LoW) handled in the country.

Annex 4. Waste generation in the economy on the basis of models or other methods

In some cases, waste data has been reused from earlier years. These sectors and sub sectors have very small amounts of waste according to earlier surveys. An exception is hazardous waste from the service sector. In that case, the reason for reuse of data is that no reliable method is in place and hence new data collected by the previously used method would be expensive but most likely of low quality. Other NACE are based on other methods, see below.

Table 15. Waste generation in the economy on the basis of models or other methods.

Waste from Agriculture, Forestry and Fishing (NACE 1-3)		
1	Scope of the model (waste types and economic sectors covered)	All wastes in NACE 1-3.
2	Basic data for the estimations (production figures etc.)	The results obtained from this sector were based on a combination of several different methods, mainly: • Waste factors • Trade organizations and other companies • Official statistics • Development project • Reuse of data
3	Description of the model and the factors applied	- Waste factors: Based on an earlier development projects ("Metodutveckling för Jordbruks-, skogsbruks- och fiskesektorn" by Kjell Rasmusson, SCB and Jan-Olov Sundqvist, IVL. 2007 and "Översyn av NACE A inför ASP 2016" by Jonas Allerup and Annika Gerner, SCB. 2015) - Trade organizations and other companies: Organizations such as Keep Sweden Tidy, Konvex AB (cremation of animals), Swedish Waste Management and Swedish Ensilage Plastic Recycling. - Official statistics: From Statistic Sweden, Swedish EPA, The Swedish Agency for Marine and Water Management and the Swedish Board of Agriculture. - Development project: See "Household waste from business" later in this annex.

		- Reuse of data: For some waste streams there was no other possibility than to reuse data from the prior WStatR 2008.

Waste from Manufacture of textiles, wearing apparel and leather (NACE 13-15)		
1	Scope of the model (waste types and economic sectors covered)	Data reused from WStatR2018.

Waste from Manufacture of wood and products of wood and cork (NACE 16)		
1	Scope of the model (waste types and economic sectors covered)	Wood waste data are updated. Other waste types are reused from prior WStatR.

Waste from Manufacture of furniture, other manufacturing... (NACE 31-33)		
1	Scope of the model (waste types and economic sectors covered)	Data reused from WStatR2018.

Electricity, gas, steam and air conditioning supply (NACE 35)		
1	Scope of the model (waste types and economic sectors covered)	Combustion Plants Waste from combustion Plants NACE D35 was surveyed in WStatR2018. In WStatR2020 Waste from combustion plants is extrapolated from gross electricity supply in combination with waste amount from WStatR2018. The survey regarding 2012 is used for non-response imputation. For all waste types except ashes, non-response imputation is made on plant level assuming that waste generation is proportional to energy generation. Concerning the large waste categories, 12.4 and 12.8 (both ashes), a slightly different model for non-response imputation is applied. Based on the 2012 survey, factors of ash generation per MWH of combusted fuel (per fuel type) were derived, and used on facility level (for the non-responding part of the population). Other sub sectors Some sub sectors have been reused. Other sub sectors have been adjusted (e.g. according to quantity produced, number of facilities in service).

Water supply, sewage, remediation act (NACE 36, 37 and 39)

1	Scope of the model (waste types and economic sectors covered)	NACE 36: Updated with activity data for reference year 2015 (data updated every five years). NACE 37: Common sludges. The reporting according to Council Directive of 12 June 1986 on the protection of the environment, and in particular of the soil, when sewage sludge is used in agriculture (86/278/EEC) is due every second year. The last reporting period available in the waste statistics production process, refers to 2016 data. These were the newest available data at the time of data collection. It should be noted that the sector is considered as very stable and that sludge quantities vary only marginally between years. NACE 37 Other wastes: Waste factors from WStatR2012 was used but updated with regards to quantity of produced sludge. Data reused from WStatR2014 for NACE 39.

Construction (NACE 41-43)		
1	Scope of the model (waste types and economic sectors covered)	All wastes in NACE 41-43 Construction
2	Basic data for the estimations (production figures etc.)	Data reported to the environmental reports register (SMP) from facilities receiving construction and demolition wastes
3	Description of the model and the factors applied	All construction and demolition wastes are considered to be included in the main data source. Data on dredging spoils is collected from the Swedish Agency for Marine and Water Management. Other wastes (non-C & D-waste) are calculated using factors based on information from a few large building companies.

Service sector (parts of G-Q)		
1	Scope of the model (waste types and economic sectors covered)	In the service sector data from several different public enterprises, authorities and agencies have been used, for example: - Material companies according to the extended producer's responsibility

		- Swedish Transport Agency (reused from 2016) - Swedavia (Swedish Aviation Authority) (reused from 2016) - Swedish Armed Forces (reused from 2016) - Region Västra Götaland (reused from 2016) They make their own surveys to cover their own needs. Usually they cover all kind of wastes from their sphere of interest. Data for hazardous waste, from other sub-sectors than those above, is reused from 2014 and has been calculated by scaling up data on collected waste by a few large waste companies. Waste from public cleansing (streets, parks etc.) was reused. Data about discarded vehicles is included. 09.1 Animal and mixed food waste from the retail sector (47), Restaurants and similar (55, 56) and institutional kitchens (education, health, elderly care and prison care) is included. Household waste has been calculated as a rest: total amounts of collected municipal waste – 78% assumed to be generated from households –amounts reported in other NACE sectors.
2	Basic data for the estimations (production figures etc.)	The amount of collected hazardous waste from service was reused from WStatR2016. The food waste factors have been obtained from previous studies in Sweden. Factors for household waste were developed using the same data.
3	Description of the model and the factors applied	See 2.
4	Routines applied or foreseen to guarantee sufficient quality (periodical revision of factors, focused surveys for verification etc.)	

Household waste from business (included in other sectors, where no other data source was available)		
1	Scope of the model (waste types and economic sectors covered)	This model concerns "10.1 Household wastes" generated in business. This factor can be used in all industries, when there is no other data source for this waste (the

		surveys does usually cover the household waste). For 2018, it was used for NACE A01-03, D35 E36-37-39 and F41-43
2	Basic data for the estimations (production figures etc.)	The factor is 86 kg per employee. The number of employees is obtained from Statistics Sweden.
3	Description of the model and the factors applied	In 2013 an analysis from enterprises (or rather local units) was made that has reported the household waste in the inquiries. The result showed that it was 86 kg/employee (CV = 31%).
4	Routines applied or foreseen to guarantee sufficient quality (periodical revision of factors, focused surveys for verification etc.)	This factor is expected to develop. Improved source separation and waste prevention programs may change the amounts.

Annex 5. Determination methods for waste generated by households

The data about waste generation from households (see Table 16 below) is retrieved from different trade organizations and producer's responsibility organisations that make own surveys of the wastes they handle.

Table 16. Determination methods for waste generated by households.

1	**Indirect determination via waste collection**	
1.1	Description of reporting unit applied (waste collectors, municipalities)	The data about waste generation from households is retrieved from different trade organisations and producer's responsibility. These organisations make their own inquiries: • Swedish Waste Management collects data from all municipalities about household waste (including household waste from business) generation and treatment. • Swedish Waste Management also collects data of collected household waste from household (inquiry to the municipalities) • In Sweden, there are several producer responsibility organisations (here referred as material companies) which are responsible for different types of packaging materials. The material companies have provided data about generated and recycled packaging waste. • El-Kretsen (producer's responsibility organisation for WEEE) reports collected and treated amounts of WEEE. Remark: we have assumed that 08 Discarded equipment from household mainly consists of WEEE. • The national corporation of Swedish pharmacies have earlier collected data about medical wastes, but due to reorganisation no data was available after 2016.
1.2	Description of the reporting system (regular survey on waste collectors, utilisation of administrative sources)	Data is retrieved from the sources above, registers and from experts.
1.3	Waste types covered	EWC stat codes: 01.3; 02; 06.3; 07.1; 07.2; 07.3; 07.4; 07.5; 08.1; 08.41; 08; 09.1; 09.2; 10.1; 11; 12.1
1.4	Survey characteristics (1.4a – 1.4d)	
	a) Total no. of collectors /municipalities (population size)	290 municipalities
	b) No. of collectors/municipalities selected for survey	290 municipalities
	c) No. of responses used for the calculation of the totals	Unknown. The calculation is performed by Swedish Waste Management and the number of responses varies between types of wastes.
	d) Factor for weighting	Unknown. The calculation is performed by Swedish Waste Management and the number of responses,

		and hence the weighting factors, vary between types of wastes.
1.5	Method applied for the differentiation between the sources household and commercial activities	In most types of "household waste" also commercial waste is included. We have made a judgement from case to case of the amount from households. Discussions have been held with experts from each data source.
1.6	Percentages of waste from commercial activities by waste types	Different for each type of EWC-Stat code. For EWC-Stat 10.1, 22% of the collected waste is assumed to be generated by commercial activities and hence 78% is reported in the household sector. For item 06.3, 07.1, 07.4 and 07.6, 90% is reported in the household sector and for 12.1 the fraction is 50%.
1.7	Population served by collection scheme for mixed household and similar waste, in %	100

2	**Indirect determination via waste treatment**	
2.1	Specification of waste treatment facilities selected	Not applicable
2.2	Waste types covered	Not applicable
2.3	Method applied for the differentiation between the sources household and commercial activities	Not applicable
2.4	Percentages of waste from commercial activities by waste types	Not applicable